DARCEN

# SHARP TECHNICAL MANUAL
# TECHNISCHE ANLEITUNG

## VHS VIDEO CASSETTE RECORDER

## VHS VIDEO-CASSETTEN-RECORDER

## For VC-S1000 SERIES [PAL]
## DER VC-S1000 SERIE [PAL]

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SHARP CORPORATION

# TAPE EDITING IN INSERT MODE WITH ROTARY ERASE HEAD

## 1. Edit function in insert mode

See Figs. 1-1 and 1-2.)

A rotary erase head is adopted instead of the conventional full erase head to perform tape editing in insert mode. After the rotary erase head has erased the signals of individual frames recorded on the video and HiFi audio tracks of a tape, new video and HiFi audio signals are recorded on the tracks without signal disturbances at the cut-in/cut-out points.

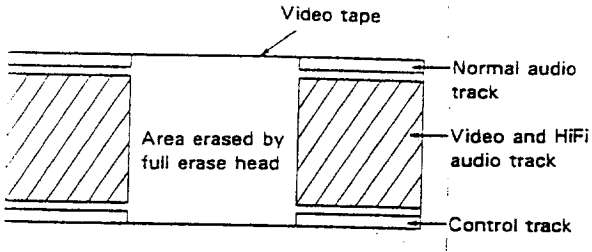



Figure 1-1.

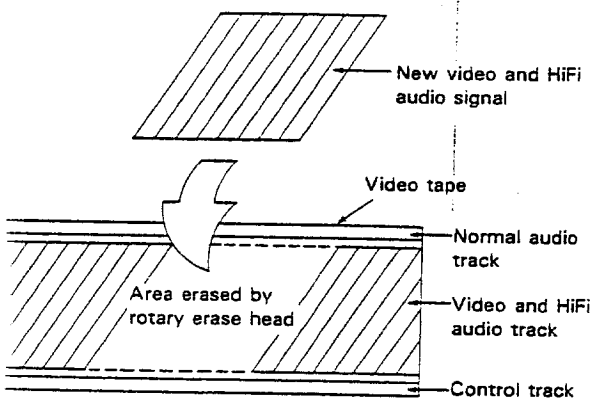

New video and HiFi audio signal
Video tape
Normal audio track
Area erased by rotary erase head
Video and HiFi audio track
Control track

Figure 1-2.

Table 1-1. Operating mode of each circuit during insert editing

| | |
|---|---|
| Video circuit | REC mode |
| HiFi audio circuit | REC mode |
| Normal audio circuit | PB mode |

Table 1-2. Outputs of system control IC during insert editing

| | |
|---|---|
| ⑳ EE (L) | L (REC mode) |
| ㉒ ALPB (L) | H (REC mode) |
| ㉓ BIAS CTL (L) | L (REC mode) |
| ㉔ HIFI CTL (L) | L (REC mode) |
| ㉕ NORMAL BIAS CTL (L) | H (PB mode) |
| ㉖ RE CTL (L) | L (REC mode) |
| ㉟ INSERT (L) | L (INSERT mode) |
| ㊺ NORMAL EE (L) | H (PB mode) |

## 2. Configuration of rotary erase head drum

The rotary erase head drum has two heads. The first head is the rotary erase head with a erasing track width of 96 μm and the second is the dummy head which works as a counterbalance for the rotary else head.

The rotary erase circuit is composed of a mono-multivibrator, flip-flops, oscillators and other components. This circuit controls the rotary erase signal and adjusts erase and record timing of the HiFi audio signal and video signal based on the control signal.

## 3. Erase and record pattern

(See Figs. 1-3 thru 1-6.)

The rotary erase head is mounted at a position 53.5 μm higher than the VL and VR heads on the drum since it must erase the video and HiFi audio tracks in both SP and LP modes. However, the rotary erase head can not erase across the full track width, leaving at least 5 to 6 μm of non-erased section on each track.

In SP mode, after the rotary erase head has erased the signals, record heads are switched from the AR head to the VL', AL and VR' heads sequentially. Recording of one frame video signal is completed within 46.7 msec while the drum rotates 1 1/6 times. Recording of one frame HiFi audio signal is completed within 33.3 msec while the drum makes 5/6 rotation.

In LP mode, after the rotary erase head has erased the signals, record heads are switched from the AR head to the AL, VL, AR, VR, AL, VL and VR heads sequentially.

Recording of one frame video signal is completed within 106.7 msec while the drum rotates 2 4/6 times. Recording of one frame HiFi audio signal is completed within 73.3 msec while the drum makes 1 5/6 rotations.

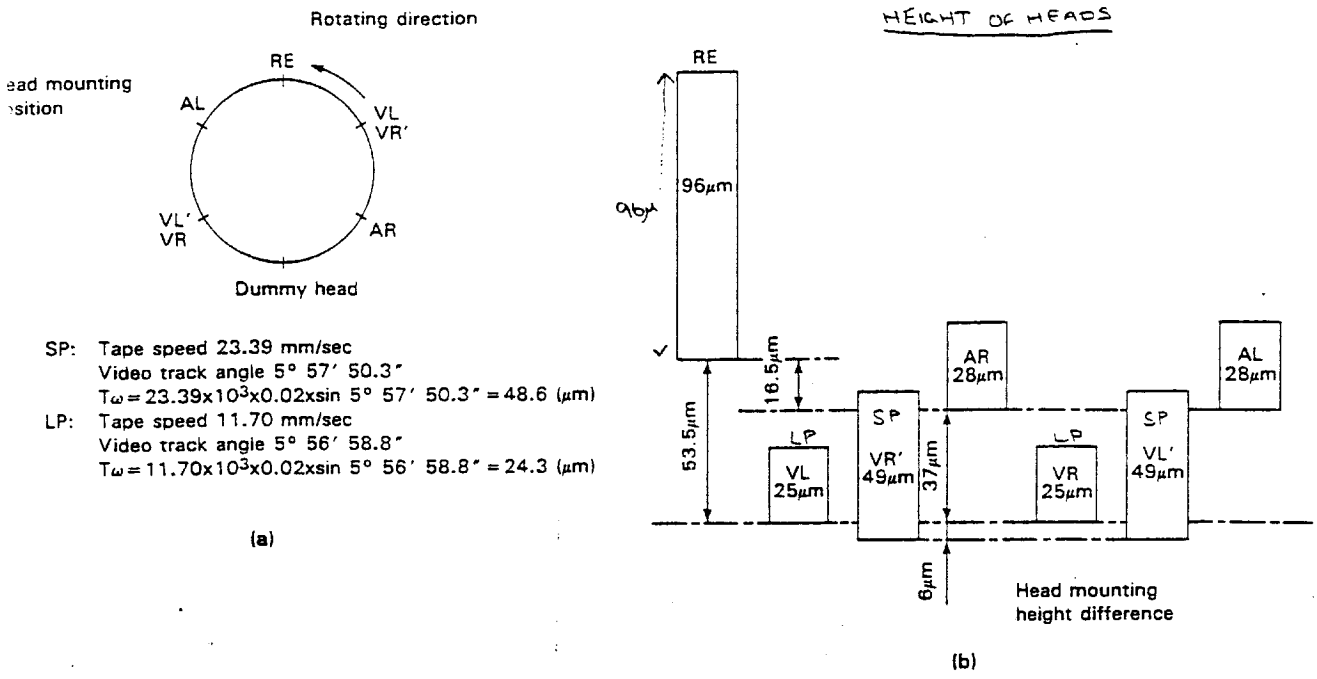



Figure 1-3. PAL S-VHS

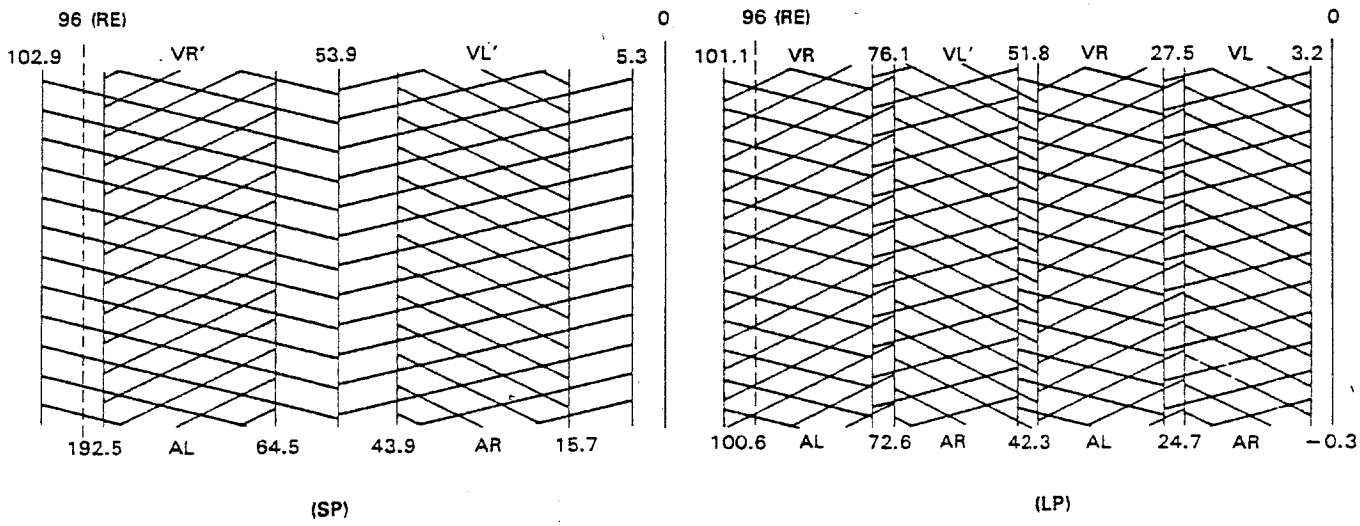



Figure 1-4. Record pattern

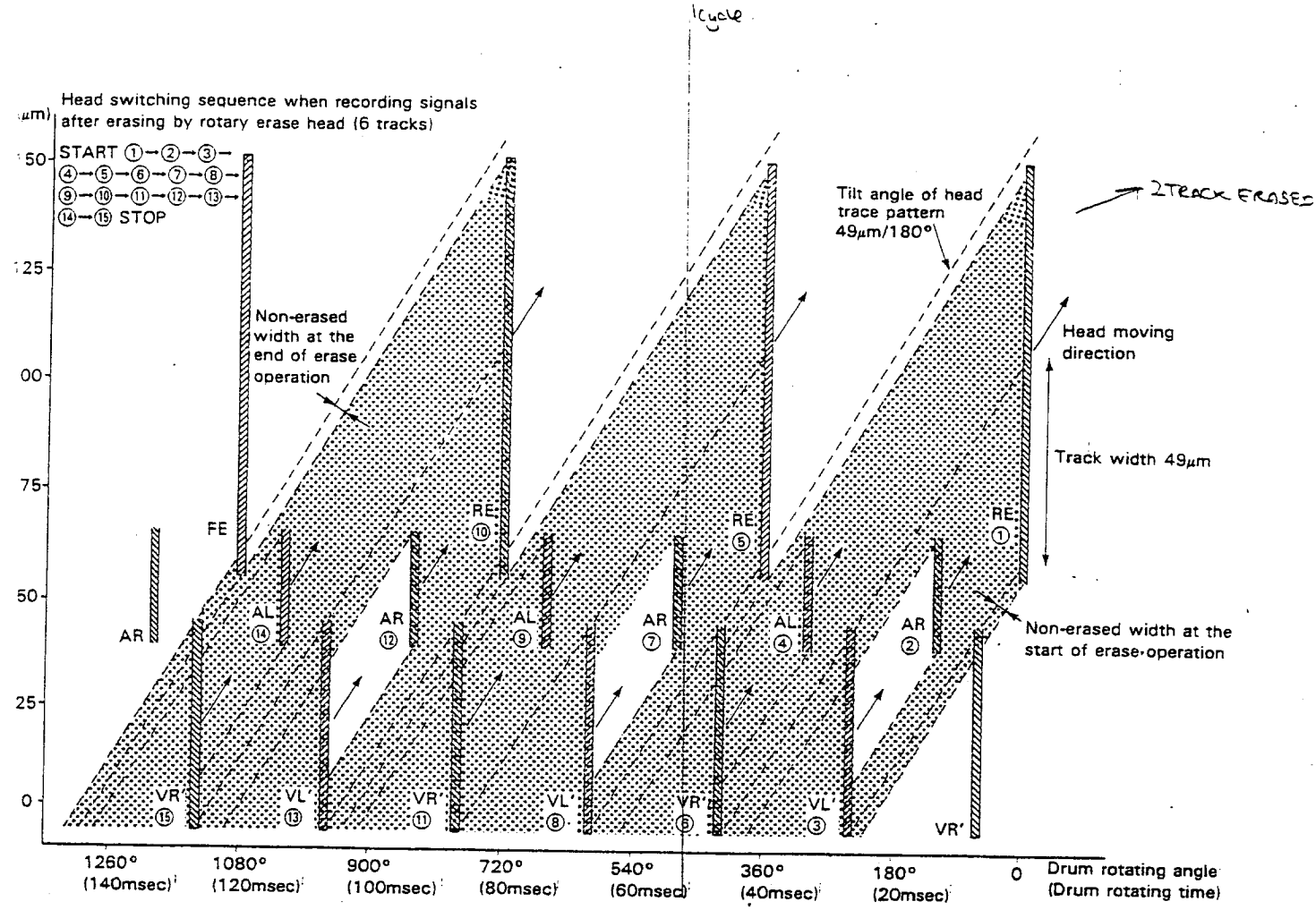



Figure 1-5. SP

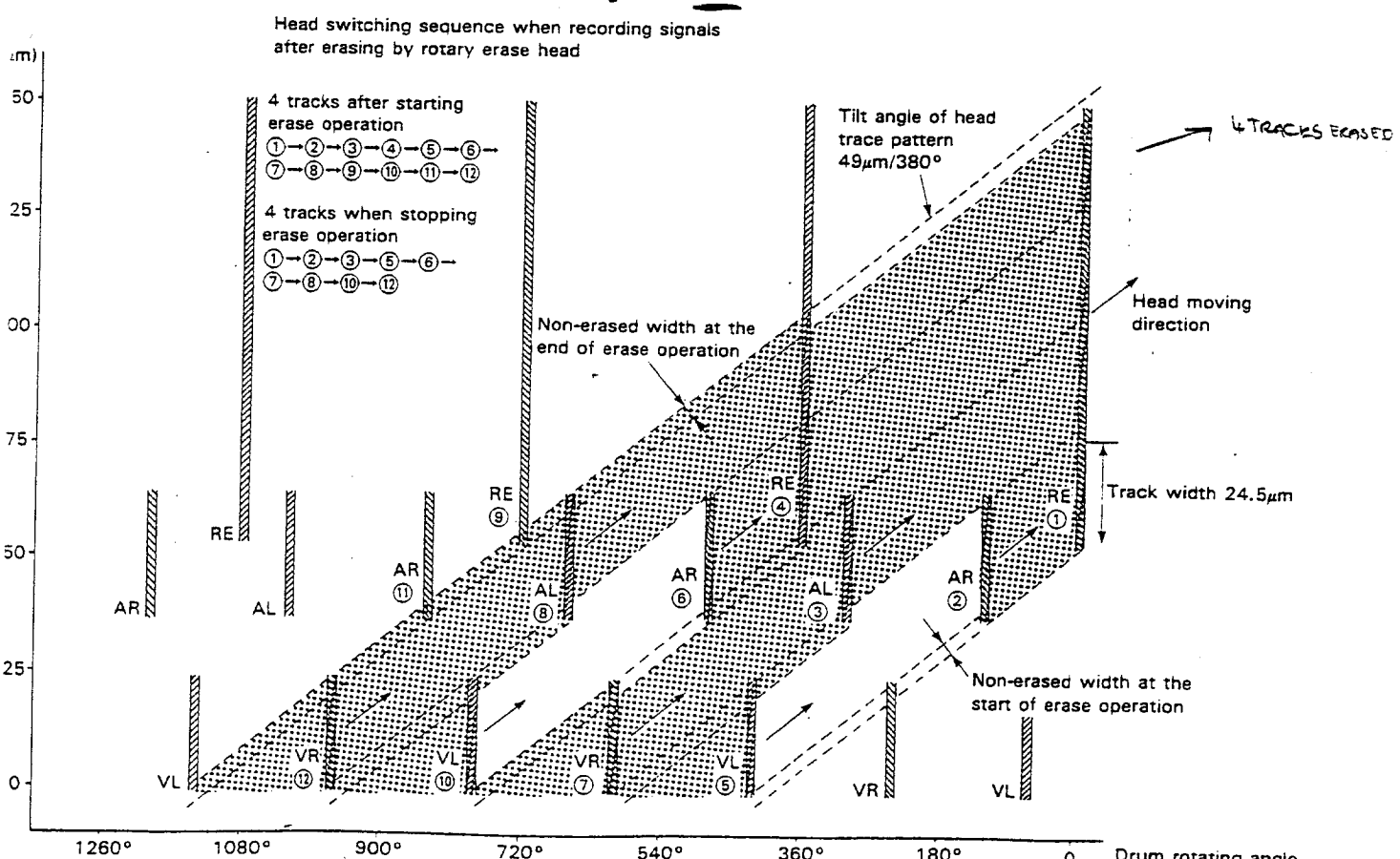





Figure 1-6. LP

4. **Configuration of rotary erase circuit**
(See Fig. 1-7.)
The rotary erase control signal outputted from the system control IC is switched while the rotary erase head is not in contact with the tape. The rotary erase signal is controlled only by the rotary erase control signal.
HiFi head switching pulses are produced by giving a delay time corresponding to the difference in head mounting angles to the head switching pulses which are used as reference for drum rotation.

The HiFi head switching pulses are used to adjust the timing of the HiFi control signal coming from the system control IC. The resultant HiFi record control signal controls record timing of the HiFi audio signal.
Video signal record timing is controlled by the video record control signal so that the video signal is first recorded by the L channel head. The video record control signal is produced by adjusting the timing of the bias control signal from the system control IC with reference to the chroma rotary signal.

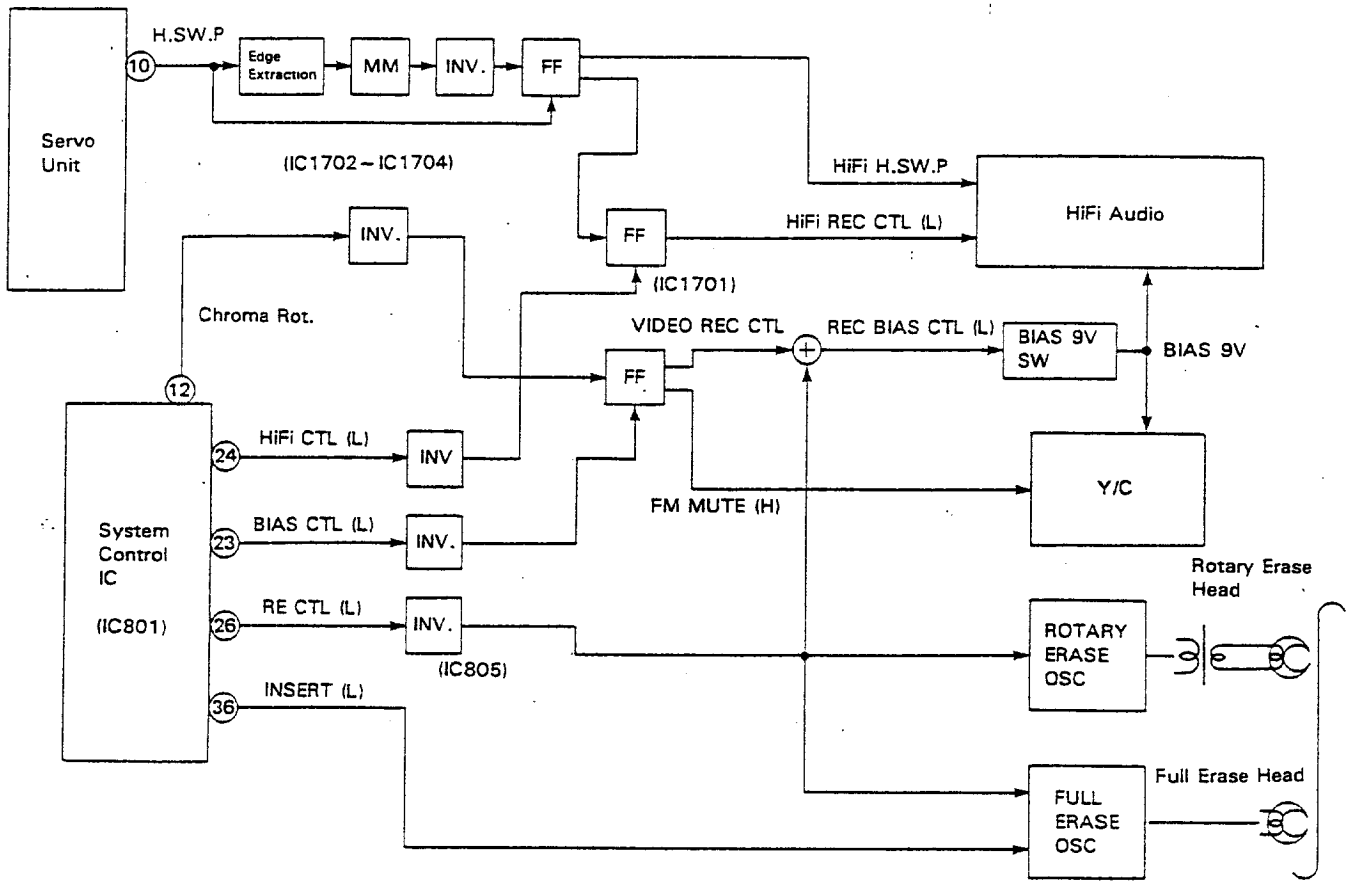



Figure 1-7. Flying erase block diagram

### 5. Erase and record timing

(See Figs. 1-8 and 1-9.)

Erase timing by the rotary erase head is controlled in the following manner. The rotary erase head contacts the tape 13.3 msec after the rising edge of each head switching pulse during which period the drum makes 2/6 rotation. Since the tape is erased every 1/2 rotation of the drum, the rotary erase control signal outputted from the system control IC is switching in synchronism with the rising edges of the head switch pulses.

Record timing of the HiFi audio signal is controlled by the HiFi record control signal which is produced in the following manner. The head switching pulses going through the mono-multivibrator are delayed 6.7 msec allowing 1/6 rotation of the drum. The delayed pulses, or the HiFi head switching pulses, adjust the timing of the HiFi control signal fed from the system control IC to the flip-flop. The output of the flip-flop is used as the HiFi record control signal.

Video record timing is adjusted so that the recording sequence starts with the L channel and ends with the R channel. Timing of the bias control signal fed from the system control IC is adjusted in the flip-flop circuit by using the chroma rotary signal. The output of the flip-flop is used as the video record control signal.

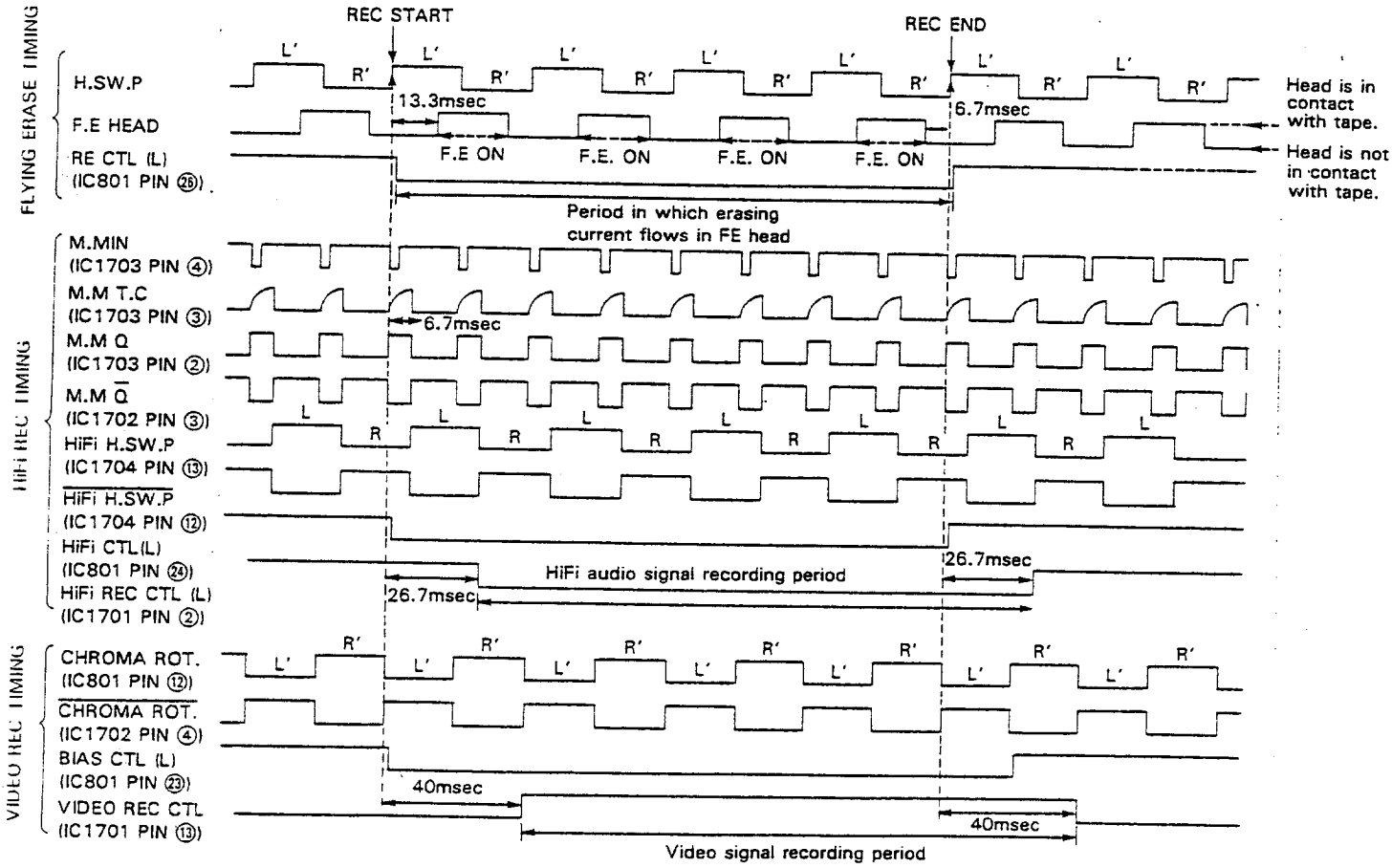



Figure 1-8. SP timing chart

F.E = FLYING ERASE HEAD.

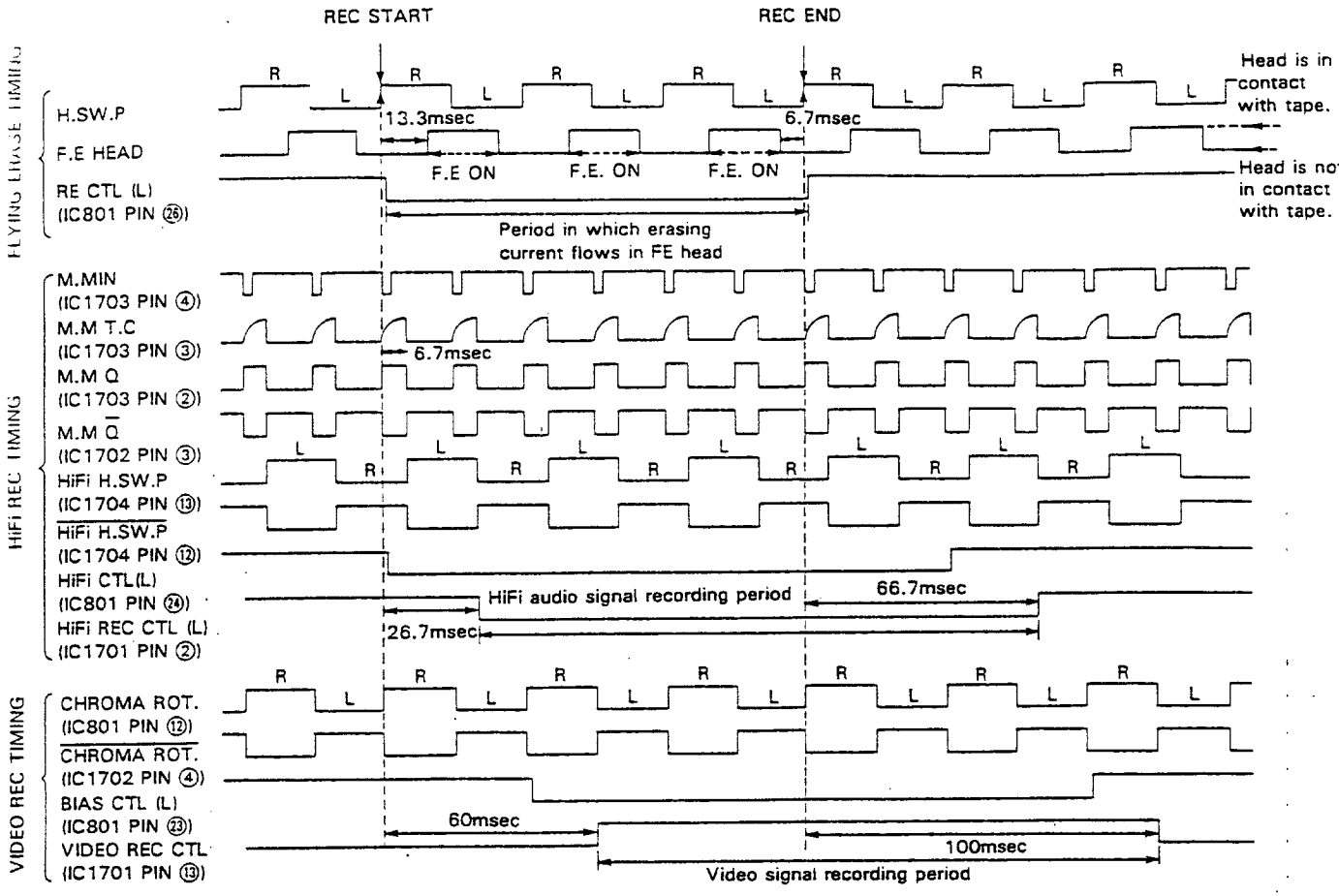



Figure 1-9. LP timing chart

## 6. Erase characteristics

(See Fig. 1-10.)

To provide compatibility with the S-VHS system, the oscillating frequency is set to 10 MHz which lies outside the video signal bandwidth. An erasing current of 100 mApp helps achieve sufficient erasing effects. The gap width of the flying erase head is set to 4 $\mu$m to increase the number of reversing the magnetizing direction during erase operation.

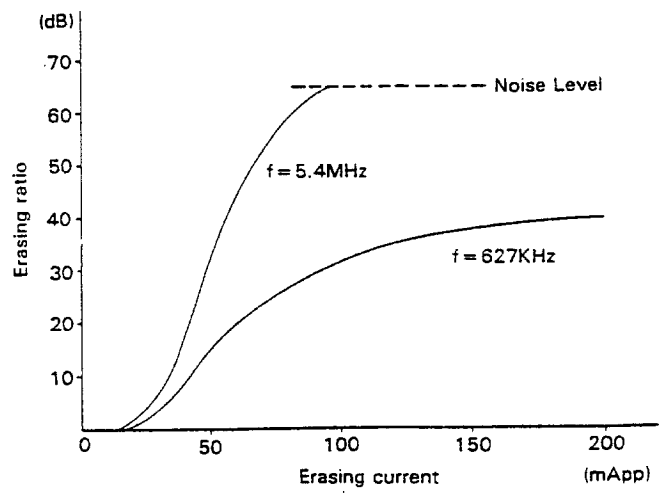



Figure 1-10.

# OSD (On-Screen Display) AND VIDEO OUT SELECT CIRCUIT

**Functions**

To display the contents of timer recording on the television screen with letters, numbers, and symbols using the special LSI for controlling the character pattern display on the TV screen.

## 1. CIRCUIT BLOCK DIAGRAM

### 1-1. System block diagram

First, in order to understand the overall connections of the circuits, look at the large circuit block diagram in Figure 2-1.

The OSD system is controlled by the serial signals from the timer microcomputer. The OSD is generated by IC01. Characters and symbols are stored in this ROM. The serial signals read out the desired character or symbol, specify the lay out, and fit the character or symbol into the composite video signal input from the Y/C circuit. In this case, the position of the character or symbol on the screen is also set in the ROM in IC01, but the horizontal position and size are controlled with the external oscillator. The horizontal synchronization signal and vertical synchronization signal input from the outside become the standard for the position. The OSD generation circuit is one function of IC01. It also uses the background signal output to generate the blue background. The blue background is switched on and off by the serial data from the timer. The blue background is output by replacing the regular signal with the blue background in the superimposed circuit in IC01. Superimposed onto the blue background is also carried out in this section.

The video out select switch circuit switches the Y-signal and colour signal outputted from the Y/C circuit and the OSD signal produced by the OSD circuit for individual output pins in each mode of the VCR. The OSD circuit and video out select switch circuit are composed of RH-IZ0164GEZZ on the main PWB and its peripheral circuits.

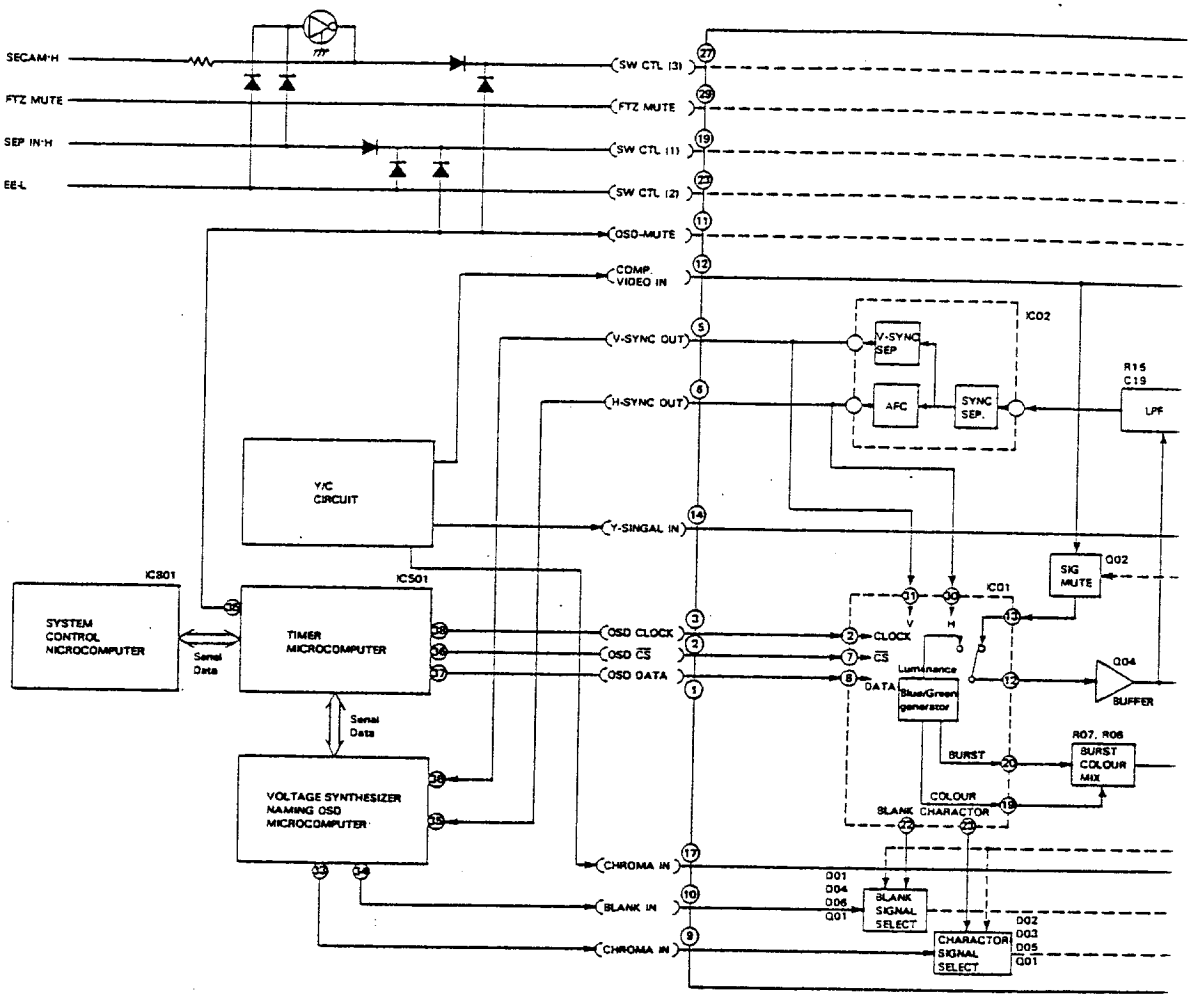
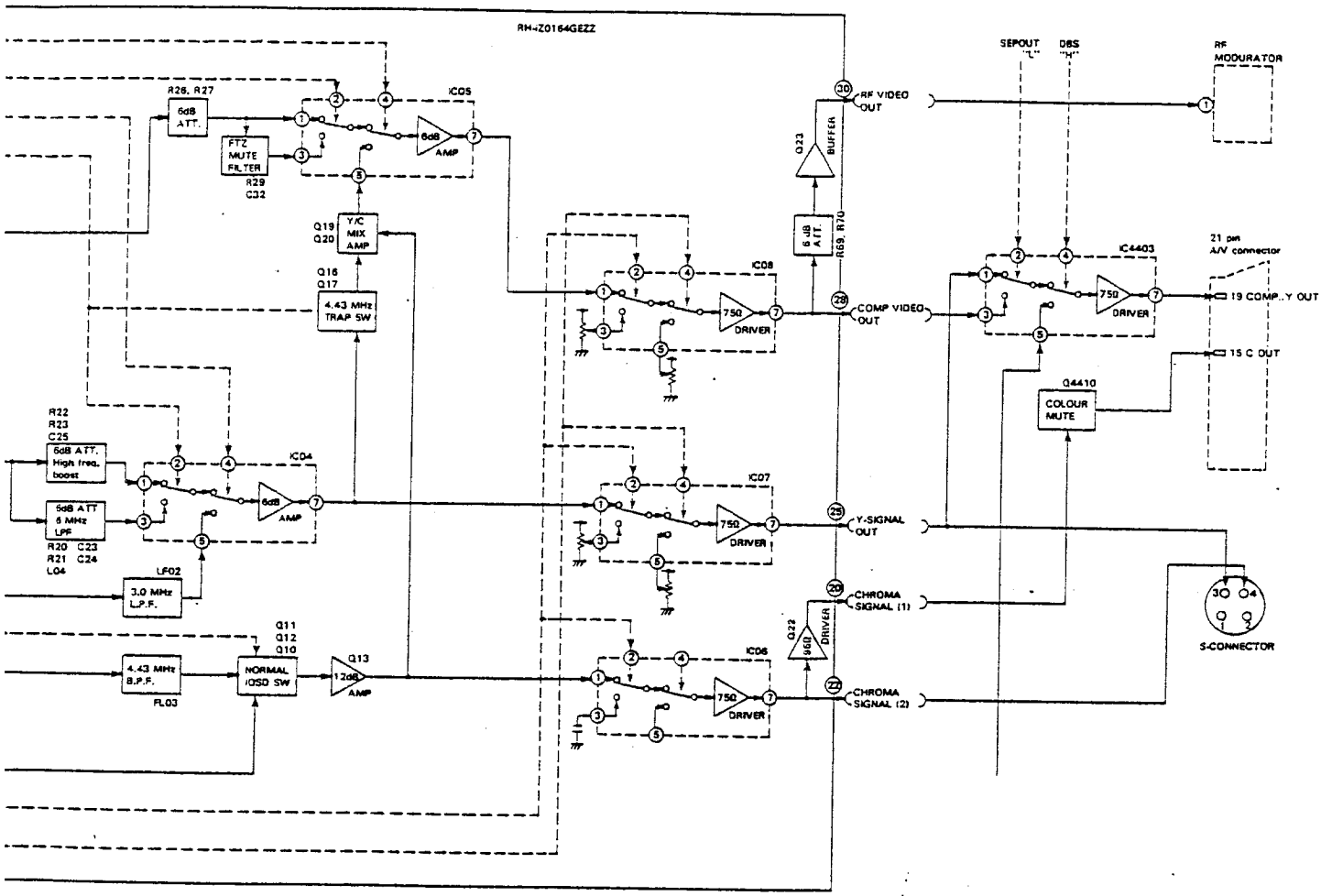

SECAM'H
FTZ MUTE
SEP IN'H
EE-L
SW CTL (3)
FTZ MUTE
SW CTL (1)
SW CTL (2)
OSD-MUTE
COMP. VIDEO IN
V-SYNC OUT
H-SYNC OUT
Y-SINGAL IN
OSD CLOCK
OSD CS
OSD DATA
CHROMA IN
BLANK IN
CHROMA IN
IC02
V-SYNC SEP
AFC
SYNC SEP.
R15 C19
LPF
Y/C CIRCUIT
IC801
SYSTEM CONTROL MICROCOMPUTER
Serial Data
IC501
TIMER MICROCOMPUTER
Serial Data
VOLTAGE SYNTHESIZER NAMING OSD MICROCOMPUTER
IC01
SIG MUTE
Q02
CLOCK
DATA
Luminance
Blue/Green generator
Q04
BUFFER
BURST
R07, R06
BURST COLOUR MIX
COLOUR
BLANK
CHARACTOR
D01
D04
D06
Q01
BLANK SIGNAL SELECT
CHARACTOR SIGNAL SELECT
D02
D03
D05
Q01

Figure 2-10.




am of OSD and video out select switch circuits.

## 1-2. OSD LSI operations

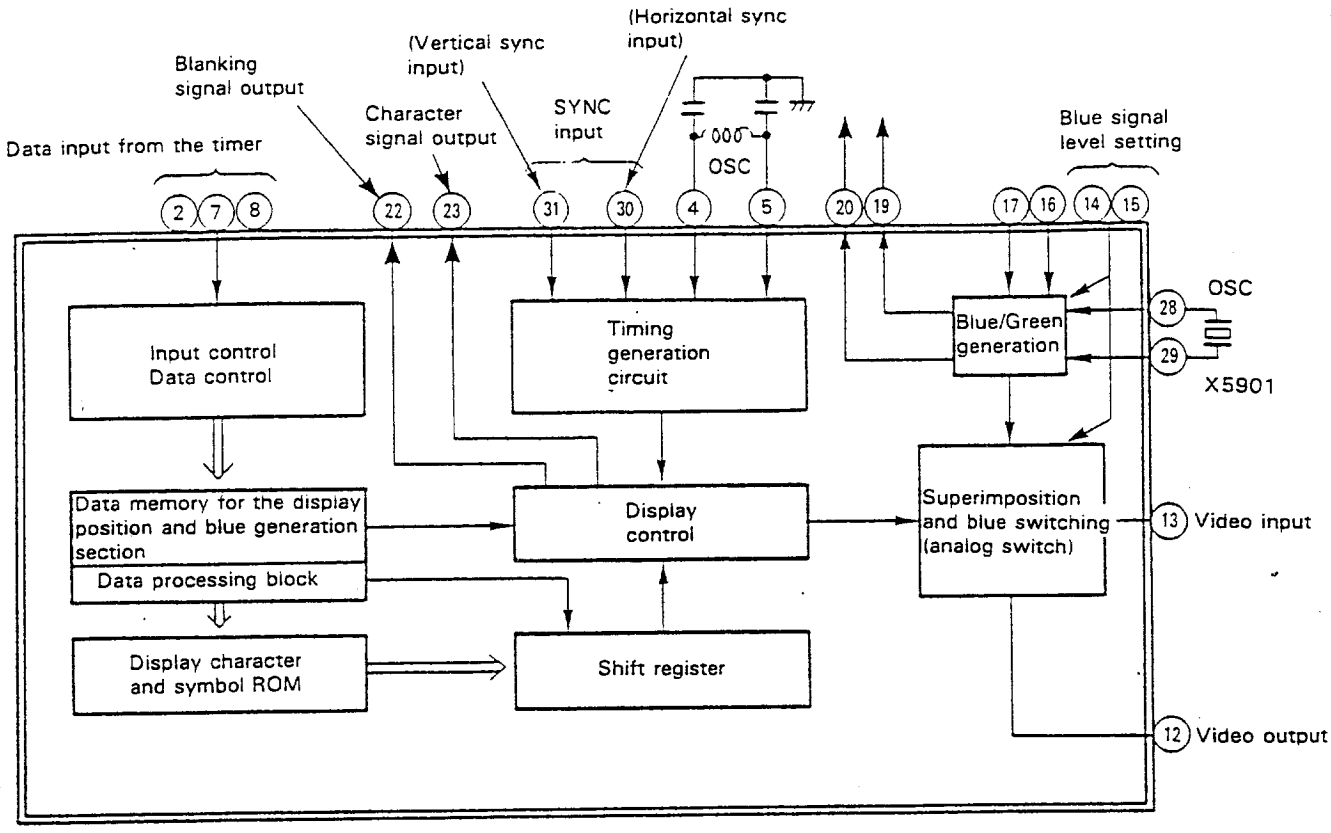



**Figure 2-2. Internal block diagram of the OSD IC01**

Here is an explanation of the basic operations of the OSD. We will look at how the characters and symbols are arranged, how they are synchronized with the video signal, and how characters and symbols are arranged in the desired position on the video signals.

The OSD IC (IC01) is controlled by the serial signal from the timer. The serial data from the timer includes the following two types of data:

① Position data
② Character data

The position data specifies a position on the screen with the screen divided as shown in Figure 2-3 into 10 rows and 24 columns. The character data specifies what is to be displayed in the row specified by the position data. Since the character data also includes blanks, if a character is to be shown in the 3rd column, the character data is blank, blank, character. In other words the character data also specifies the column the character is to be shown in.

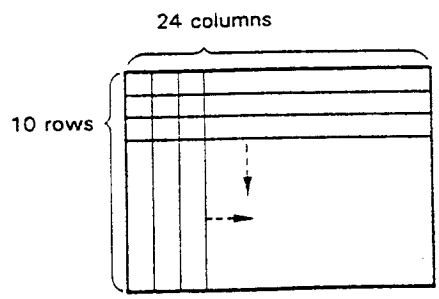
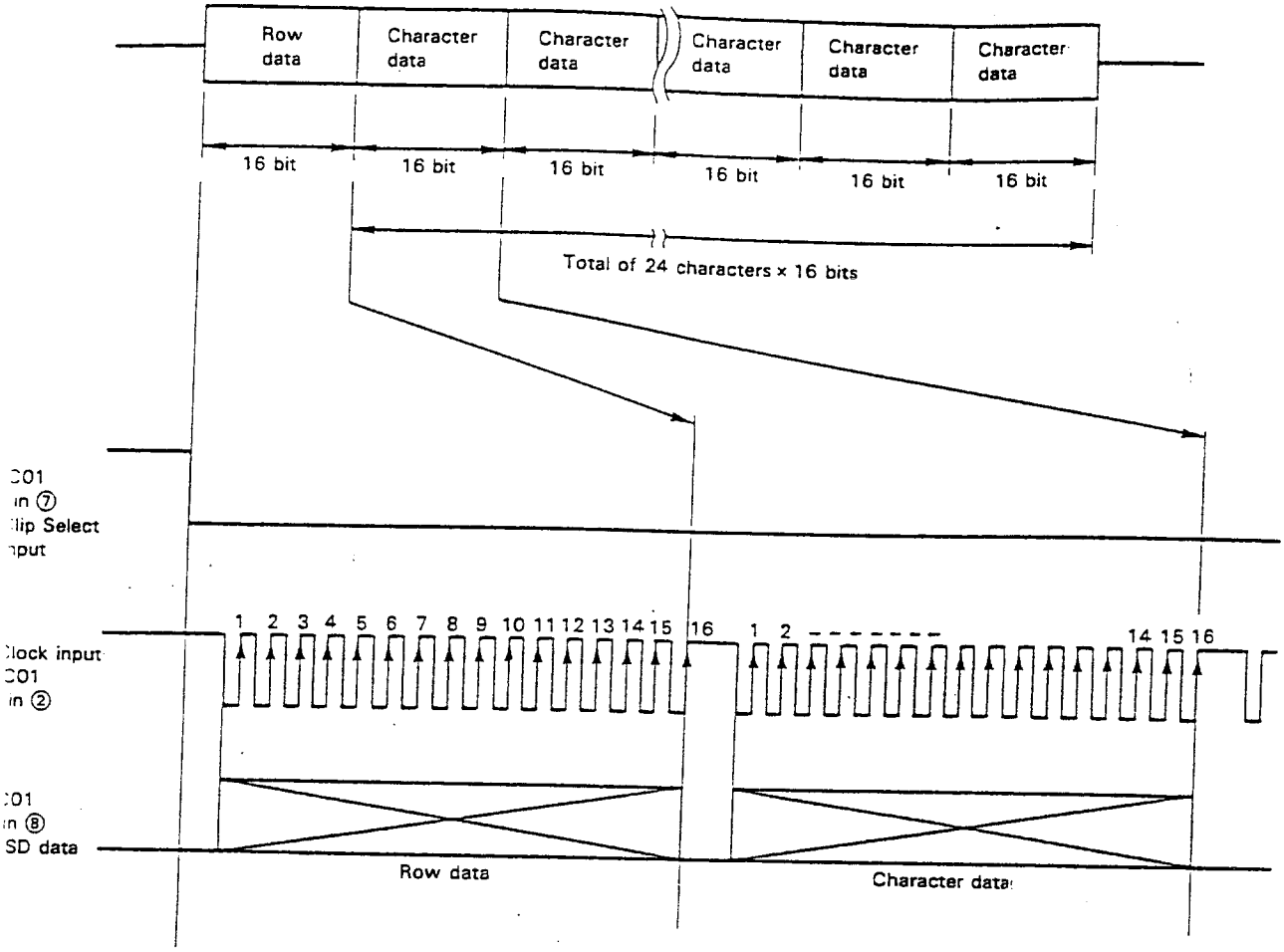



**Figure 2-3. Screen partitions**

Here is a timing chart for 1 row of data.




**Note:** Since the clock input is made with the timer software, the synchronization duty cycle is not fixed.

, we will discuss the row data. The row data is ified with the address that positions the leftmost e 10 × 24 dot screen partitions. There is an address for each of the partitions in the 10 rows by 24 columns, so there are a total of 240 different addresses.

| | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 0A | 0B | 0C | 0D | 0E | 0F | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ta | 18 | 19 | | | | | | | | | | | | | | | | | | | | | | 2F |
| | 30 | | | | | | | | | | | | | | | | | | | | | | | 47 |
| | 48 | | | | | | | | | | | | | | | | | | | | | | | 5F |
| | 60 | | | | | | | | | | | | | | | | | | | | | | | 77 |
| | 78 | | | | | | | | | | | | | | | | | | | | | | | 8F |
| | 90 | | | | | | | | | | | | | | | | | | | | | | | A7 |
| | A8 | | | | | | | | | | | | | | | | | | | | | | | BF |
| | C0 | | | | | | | | | | | | | | | | | | | | | | | D7 |
| | D8 | D9 | DA | D8 | | | | | | | | | | | | | | | | | | | | EF |

(Center omitted)

The address is a two-digit hexadecimal number.

As has already been made clear, what characters are to be displayed where is completely controlled with the serial data from the timer. In other words, the details of the display, i.e. what character to white where, is all written in the ROM in the timer. The OSD ID has the function for displaying this on the TV screen (according to the commands from the timer).
Next, we will explain the synchronization of the video signals and character signals and the determination of the position for insertion into the video signal. As explained earlier, even if the character array and position is determined, if those signals are not synchronized with the video signal into which they are to be inserted or the timing is off, then they cannot be superimposed correctly. That is why IC01 has functions for synchronizing the character singals with the video signals and matching the timing. These functions correspond to the timing generation and display control block in Figure 2-2.

• **Synchronization**

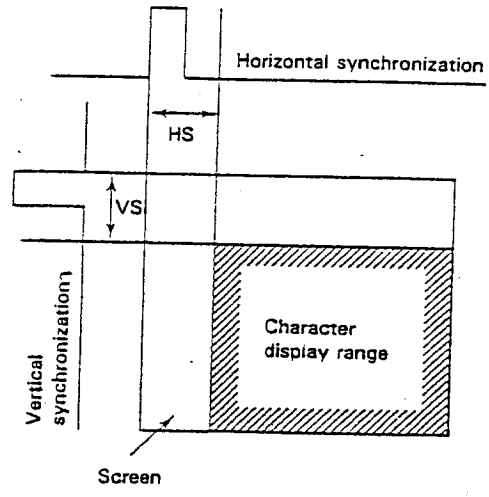
The OSD signals are synchronized with the video signals by horizontally and vertically synchronizing the OSD signal standards. The horizontal synchronization and vertical synchronization signals used are obtained by splitting them off from the video signals currently being shown on the screen. Therefore, if there is noise or dropouts in the video signal, the OSD display is disturbed.

• **The size of characters**

One character is a collection of 24 dots wide by 18 dots tall. The size of the characters is controlled by varying the number of pixels per dot. This is also prescribed by the serial data from the timer. In normal mode, 1 dot is 1H tall by 1Tc (Tc = 1/7 MHz)* wide.

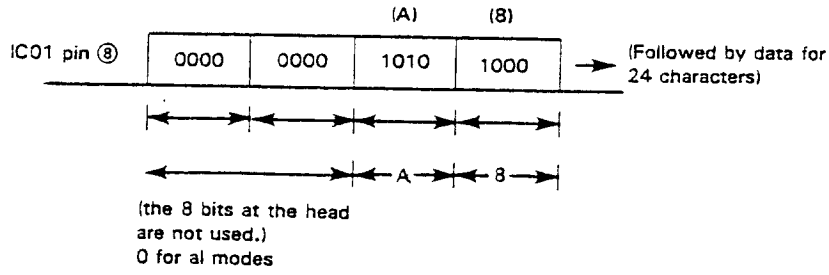
• **Timing**

The OSD IC operates with the timing shown below. The horizontal synchronization and vertical synchronization signals are prescribed by the serial data from the timer. The horizontal synchronization is generated by counting with a counter the output of the oscillator connected to Pins ④ and ⑤ of the OSD IC. The number of stages for this counter is specified with the serial data from the timer. The horizontal synchronization value is always the same: about 13 μs (oscillation frequency 7 MHz). The vertical synchronization signals are generated by counting the horizontal synchronization signals. The same as for horizontal synchronization, the number of stages is set with the serial data from the timer, but this value is always the same. The vertical synchronization = 55H.




* This is the oscillation frequency for the oscillator connected to Pins ④ and ⑤ of the OSD IC.

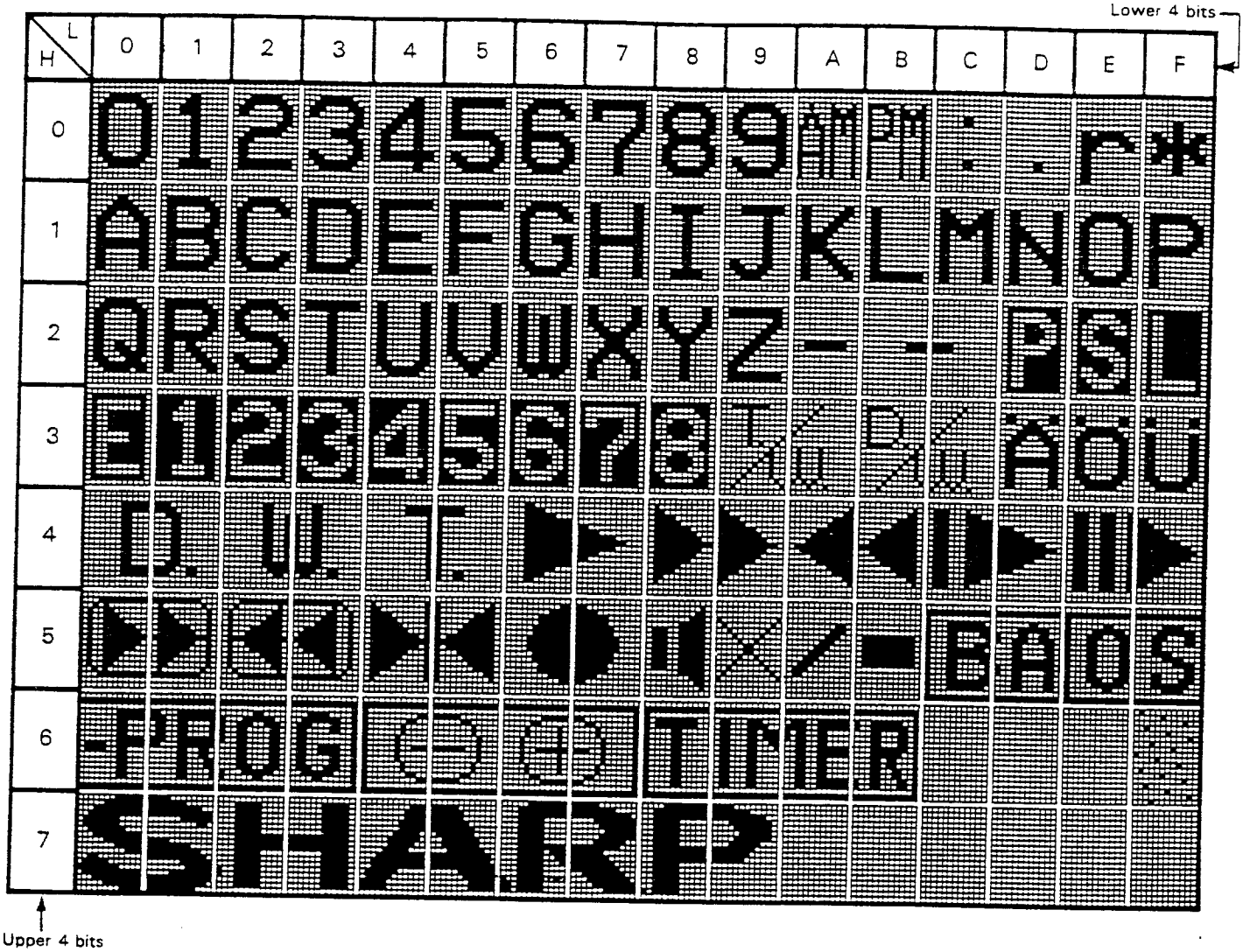
For example, the row address for the 8th row is specified this way:



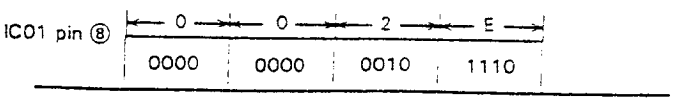

Data for one character after another for a total of 24 characters is sent to the row specified in this way. This is how data for a row is transferred. As explained already, since a blank is sent when nothing at all is to be displayed, even if there is no OSD display for the row at all, the row is specified, then 24 blanks are sent.

• Character data

A total of 112 characters are written in the internal ROM. The codes for all the characters are determined. Hera are these codes:




The character codes are all 16 bits, but the character code is made from 8 of those bits. The other 8 bits are not used and are always all Os. For example, when the character "WE" is output, the character data is:



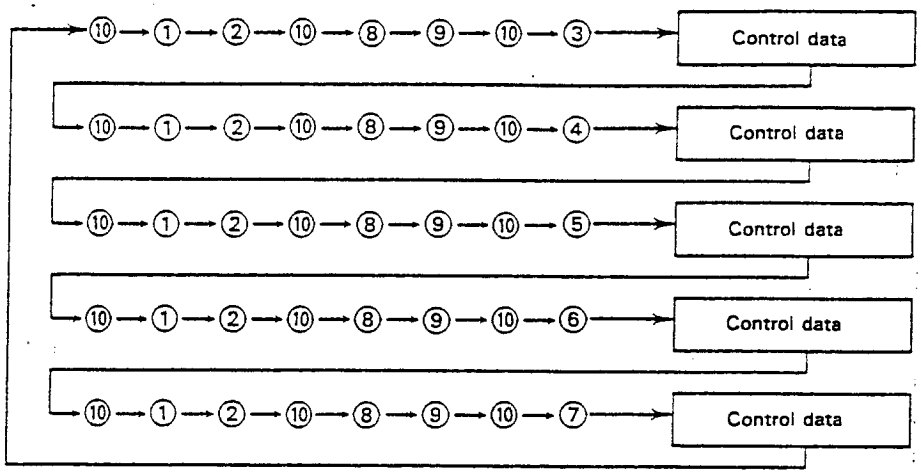

That is how the starting character position and the size of the character is determined, but as explained earlier this is all prescribed by the serial data from the timer. This serial data is transferred with a fixed interval between the character data. This transfer timing will be discussed later.

• Generating the blue background screen

The generation of the blue background screen is also controlled by the serial data from the timer. This serial data includes a data item that selects blue background, OSD, or normal, brilliance data, and colour data. In this case, the composite video signals are produced with the 17.73-MHz oscillator connected to Pins ㉘ and ㉙ as the oscillator. Since the 4.43-MHz burst signal is also generated from here, note that the precision of the 17.73-MHz signal also affects the coloring.

• Serial data

The control data is a total of 48 bits: 16 bits for the vertical position and character size, 16 bits for the horizontal position and character size, and 16 bits for the blue background control. Here is the timing this data is output with.




①-⑩: character code data for Rows 1-10

Control data: data to control such display parameters as the display position, character size, superimpose/blue background switch

## Terminal functions of IC01

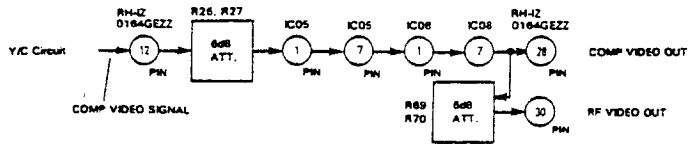
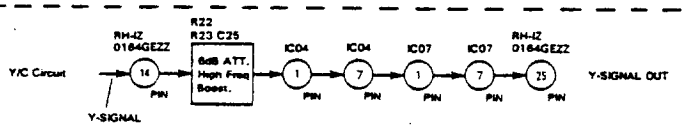
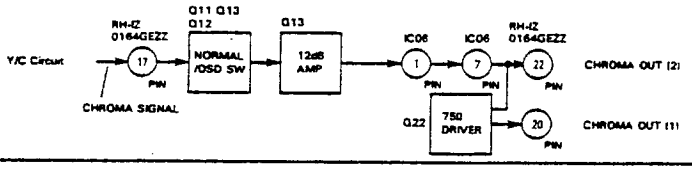
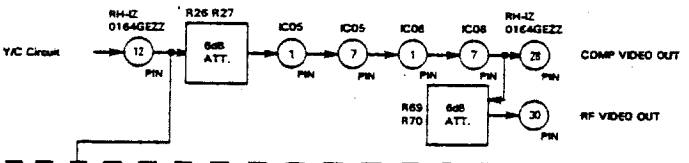
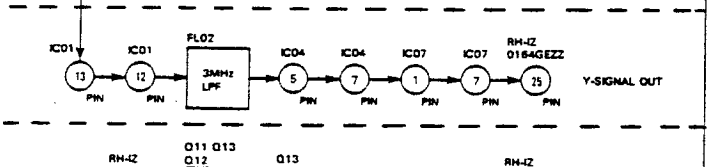
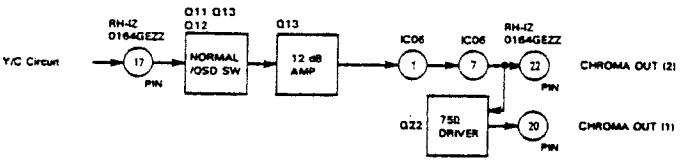
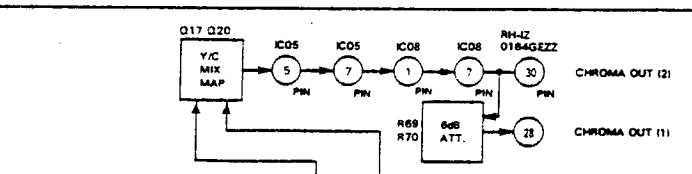
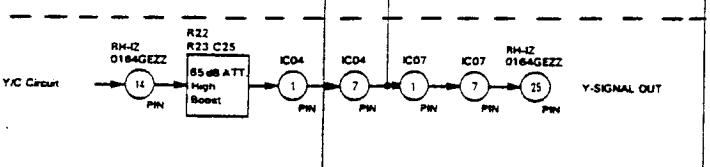
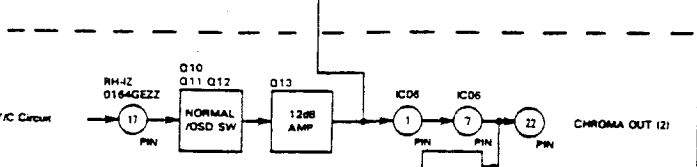
| Pin number | Code | Pin name | Function |
|---|---|---|---|
| 1 | Vss 1 | Ground pin | Digital system ground pin |
| 2 | SCK | Serial clock input | When pin ⑦ is low, OSC data (pin ⑧) is taken in at the rising edge of OSC CLOCK (pin ②); hysteresis input. |
| 3 | $\overline{AC}$ | ALL-clear input | When this signal is low, the internal circuits of the IC are reset; buit-in pull-up resistor, hysteresis input. |
| 4<br>5 | OSC 1<br>OSC 2 | External oscillator circuit pins | These are the pins the oscillation circuit for display is connected to. The standard oscillation frequency is about 7 MHz. This oscillation frequency determines the TV screen horizontal direction display position and the character width. |
| 6 | N/$\overline{P}$ | NTSC/$\overline{PAL}$ switch input | This pin is the input pin for the signal switching between NTSC and PAL synchronization signal generation. When this signal is high, NTSC synchronization is used; when this pin is low, PAL synchronization is used. This pin is connected to a built-in pull-up resistor. |
| 7 | $\overline{CS}$ | Chip select input | This is the chip select signal input pin. When serial data is transferred, the signal at this pin is low. |
| 8 | SIN | Serial data input | This is the pin through which the display control register and display data memory data and address are input serially. |
| 9 | PAOUT | Parity output | Odd parity output; error detection for one bit in 1 word of OSC DATA. |
| 10 | SYEX | Synchronizaiton signal switch input | This is the input pin for the signal switching between internal and external synchronization. When the signal at this pin is high, synchronization is external; when it is low, synchronization is internal. This pin is connected to a built-in pull-up resistor. |
| 11 | Vss 2 | Ground | This is the analog system ground. Connect it to ground. |
| 12 | CVIDEO | Composite video output | This is the output pin for the composite video signal. It outputs a 2 Vp-p composite video signal. During superimposition, the character output is piled onto the CVIN signal. |
| 13 | CVIN | Composite video in | This is the input pin for the composite video signal. |
| 14 | LERK | Blanking level | This is the input pin for the signal that determines the video signal blanking level. |
| 15 | LECHA | Character level input | This is the input pin for the signal that determines the character output level in the video signal. |
| 16 | CBIN | Colour burst signal input | The signal from pin ⑳ is converted to the colour burst signal level for the video signal with an external circuit and input to this pin. |

| Pin number | Code | Pin name | Function |
|---|---|---|---|
| 17 | RSIN | Character background carrier colour signla input | The signal from pin ⑲ is converted to the carrier colour signal level for the video signal with an external circuit and input to this pin. |
| 18 | VDD 2 | Power pin | The +5V power for the analog system is connected to this pin. |
| 19 | RS | Character background carrier colour signal input | This pin outputs the carrier colour signal for the character background colour. A signal is output with a phase angle relative to the colour burst signal. The amplitude of this signal is 5 V. |
| 20 | CB | Colour burst signal output | This pin outputs the colour burst signal, 3.58 MHz for NTSC or 4.43 MHz for PAL. The amplitude of this signal is 5 V. |
| 21 | YM* | Brilliance signal output | This is the output pin for the brilliance signal. |
| 22 | BLNK* | Character background output | This is the output pin for the character background signal. |
| 23 | CO* | Character output | This is the output pin for the character signal. |
| 24 | B* | Blue output | This is the output pin for the blue signal. |
| 25 | G* | Green output | This is the output pin for the green signal. |
| 26 | R* | Red output | This is the output pin for the red signal. |
| 27 | CSYN | Composite synchronization signal output | This is the output pin for the NTSC-format or PAL-format composite synchronization signal. The polarity of this signal is negative and the amplitude is 5 V. |
| 28<br>29 | OSCOUT<br>OSCIN | Oscillation circuit for synchronization signal generation | These are the pins to which the external oscillation circuit for generating the synchronization signals is connected. The oscillation frequency is 14.32 MHz for NTSC and 17.73 MHz for PAL. |
| 30 | HOR* | Horizontal synchronization signal input | This is the input pin for the horizontal synchronization signal; hysteresis input. |
| 31 | VERT* | Vertical synchronization signal input | This is the input pin for the vertical synchronization signal; hysteresis input. |
| 32 | VDO | Power pin | The +5V power for the digital system is connected to this pin. |

## 2. VIDEO OUT SELECT SWITCH CIRCUIT

As shown in the block diagram in Figure 2-1, the video out select switch circuit is composed of RH-IZ0164GEZZ and its peripheral circuits. Table 2-1 describes the signal flows inside RH-IZ0164GEZZ in each mode and Table 2-2 shows voltages at each control pin of RH-IZ0164GEZZ.

**Table 2-1. Signal flows inside RH-IZ0164GEZZ in each mode**

| VTR mode | Input signal or playback signal | Signal flow | On-screen mode display operation |
|---|---|---|---|
| EE/REC mode | PAL composite signal input |  | When on-screen mode display is on, the blanking signal is inputted to pin ② of IC08 and the character signal is inputted to pin ④ of IC08, in which the characters are superimposed. The blanking signal and character signal are respectively supplied from pins ㉒ and ㉓ of IC01 at this time. |
| | |  | The blanking signal and character signal are inputted to pins ② and ④ of IC07 respectively so that the characters are superimposed in IC07. |
| | |  | The blanking signal is inputted to pin ② of IC06 in which the colour signal of the character data is muted. |
| | SECAM composite signal input |  | Prohibited by the timer IC, on-screen mode display is disabled in SECAM mode. |
| | |  | |
| | |  | |
| | PAL/ SECAM separate signal input |  | The blanking signal is inputted to pin ② of IC08 and the character signal is inputted to pin ④ of IC08, in which the characters are superimposed. |
| | |  | The blanking signal and character signal are inputted to pins ② and ④ of IC07 respectively so that the characters are superimposed in IC07. |
| | |  | The blanking signal is inputted to pin ② of IC06 in which the colour signal of the character data is muted. Note that on-screen mode display is disabled in SECAM mode. |

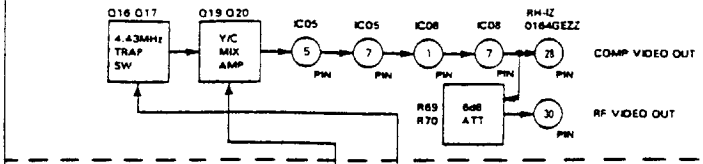
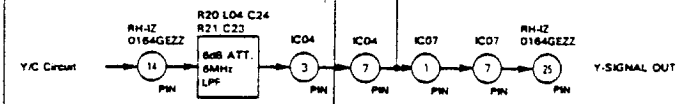
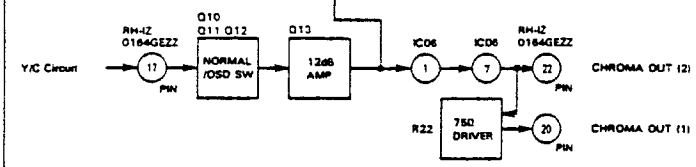
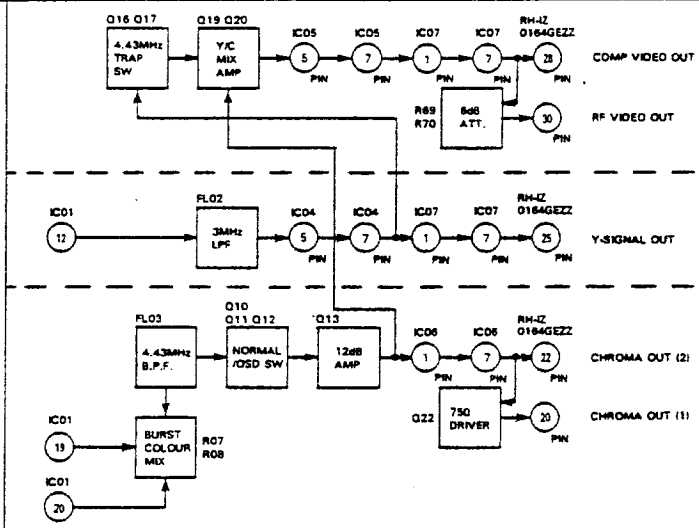
| VTR mode | Input signal or playback signal | Signal flow | On-screen mode display operation |
|---|---|---|---|
| PB mode | PAL SECAM |  | The blanking signal is inputted to pin ② of IC08 and the character signal is inputted to pin ④ of IC08, in which the characters are superimposed. |
| | |  | The blanking signal and character signal are inputted to pins ② and ④ of IC07 respectively so that the characters are superimposed in IC07. |
| | |  | The blanking signal is inputted to pin ② of IC06 in which the color signal of the character data is muted. Note that on-screen mode display is disabled in SECAM mode. |
| Blue Green Screen, TIMER OSD | Don't Care |  | |

**Table 2-2 Input control signals of RH-IZ0164GEZZ in each mode**

| VTR mode | Input signal | SW CTL 1 pin ⑲ | SW CTL 2 pin ㉓ | SW CTL 3 pin ㉗ | OSD MUTE pin ⑪ |
|---|---|---|---|---|---|
| EE/REC mode | PAL composite signal | L | L | L | L |
| | SECAM composite signal | H | L | L | L |
| | PAL/SECAM Y/C separate signal | L | L | H | L |
| PB mode | PAL/SECAM | L | H | H | L |
| Blue/Green Screen Timer OSD | Don't Care | H | L/H | H | H |

## SYSTEM CONTROLLER IC TERMINALS AND THEIR FUNCTIONS

Discussed in the following are the functions of individual pins of system controller IC RH-IX0570GEZZ (IC801):

**Table 3-1.**

| Pin No. | Signal name | Function |
|---|---|---|
| 1 | PB CTL IN | • This is an input pin for the reference signal for muting green in playback mode.<br>(1) In case the rising edge of the PB CTL signal is not detected for a period of 120 msec in PB mode, a green mute request is sent to the timer IC.<br>(2) This input also serves as a reference signal for determining the "INDEX signal write" period (61 ± 2 pulses).<br>(3) It is also used as a detecting signal which identifies a recorded tape (tab broken) in Full Auto operation.<br>• In one-shot frame advance mode, the PB CTL IN signal triggers reverse torque generation. |
| 2 | CUE SIGNAL (INDEX) IN | • This input detects a cue signal in INDEX mode.<br>(1) "H" level is inputted when recording a cue signal. ("H" level is maintained at least 20 msec.)<br>(2) Introduction search (interval search) and index search sections are set by timer control.<br>i) Setting introduction search (interval search)<br>The VCR begins introduction search operation when the FF/REW key is pressed. When "H" level of the cue signal is detected in FF/REW mode, the VCR is put into PB mode for a period of 7 sec. It then returns to FF/REW mode to continue input of the cue signal.<br>ii) Canceling introduction search operation<br>As soon as the timer flags mode cancellation, introduction search operation is canceled and the current mode is continued. If any mode key (STOP, FF, REW, PB, REC, SLOW or DOUBLE SPEED key) is pressed during introduction search operation, introduction search mode is canceled to shift the mode.<br>iii) Index search<br>When the number of skips is set in index search mode, the detected INDEX signal is transferred to the timer IC by system controller SIO. |
| 3 | H.SW.P. IN | • This is a sensor input which is used to detect the state of the drum when it must be rotated.<br>(1) The H.SW.P. input is a sensor input to be used for detecting whether the drum is rotating. 25 Hz (PAL) head switching pulses are inputted to this pin.<br>(2) The status in which the drum should rotate is expressed by the equation Drum acceleration signal = "z". (This status occurs during the period from the start of loading to the end of unloading.)<br>(3) Drum rotation is stopped if the drum sensor input stays in the same status as step (2) above for 1.6 seconds. (This is called the drum rotation detection function.)<br>• The H.SW.P. input is used as a reference signal for the FV output in trick mode (VSF/R, x2 or STILL/SLOW mode).<br>(1) In trick mode, the FV output is generated at the rising edge and falling edge of the head switching pulse (H.SW.P.) input.<br>(2) The H.SW.P. input is the signal which causes one-shot frame advance operation to start. |

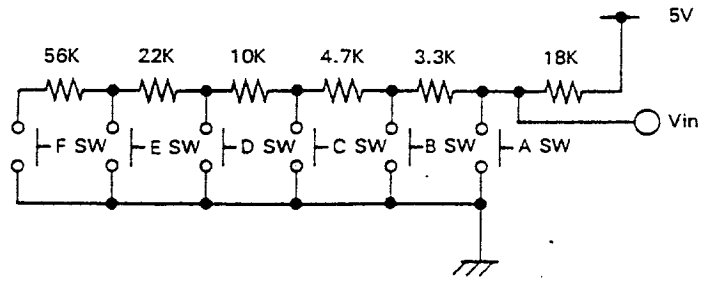
| Pin No. | Signal name | Function |
|---|---|---|
| 4 | NC | • Connected to Vdd or GND. |
| 5<br>6<br>7<br>8 | MECHANICAL POSITION SW<br>CASSETTE CTL/REC TIP SW<br>FUNCTION SELECT SW<br>SPEED DETECTION | • The circuit internally connected to pins ⑤ thru ⑧ of the IC consists of a comparator, a D/A converter, and an A/D converter which performs 6-level A/D conversion of the analog voltage.<br>Table below describes the switches which correspond to keys A thru F of the D/A converter circuit shown in the following. |

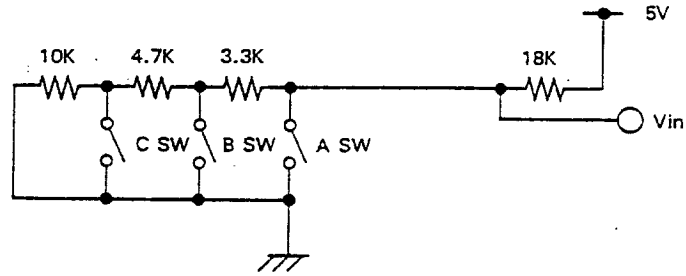
| Input pin / Key | CAM SW input | SPEED DETECTION input | FUNCTION SELECT input |
|---|---|---|---|
| A | CA SW | SP mode | Fixed VS/Double speed in SHARP spec. |
| B | HF SW | | Fixed VS in SHARP spec. |
| C | FF SW | LP mode | Variable VS/Double speed in SHARP spec. |
| D | LD SW | | Variable VS in SHARP spec. |
| E | PB SW | | Fixed VS in Philips spec. |
| F | PU SW | | Fixed VS/Double speed in Philips spec. |
| All switches OFF | SW OFF mode | | Variable VS/Double speed in Philips spec. |

**<CASSETTE CTL SW>** (Refer to cassette controller circuit.)

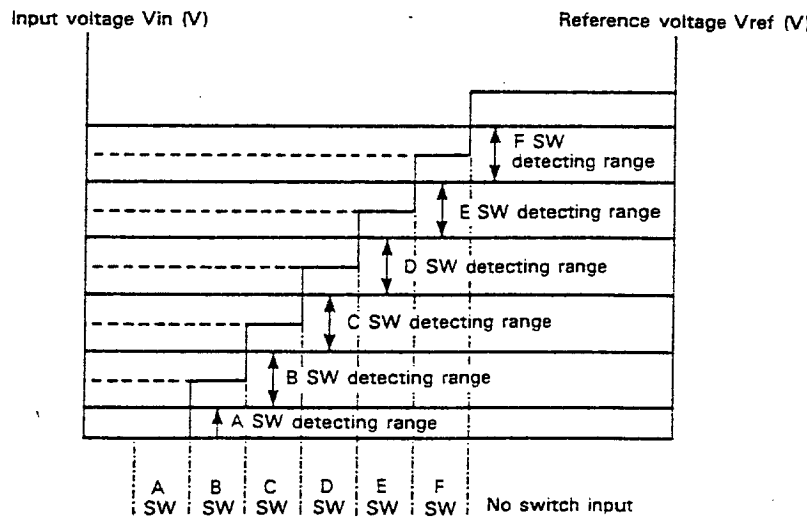
| Type / SW | Cassette controller/Automatic cassette controller | Specifications |
|---|---|---|
| A | Cassette controller SW (Detection of start of loading) | ON: Start of cassette loading<br>OFF: Other than above |
| B | Automatic loading SW (Detection of cassette loading status) | ON: Cassette loading status<br>OFF: Non-automatic loading cassette loading or cassette unload |
| C | REC. TIP SW (Detection of write-protect tab status) | ON: Write-protect tab broken<br>OFF: Write-protect tab not broken |

| Pin No. | Signal name | Function |
|---|---|---|
| | | **D/A converter circuit (MAIN BODY SW/MECHANICAL POSITION SW/ FUNCTION SELECT SW/CASSETTE CONTROLLER SW)** |




**<Cassette controller circuit>**



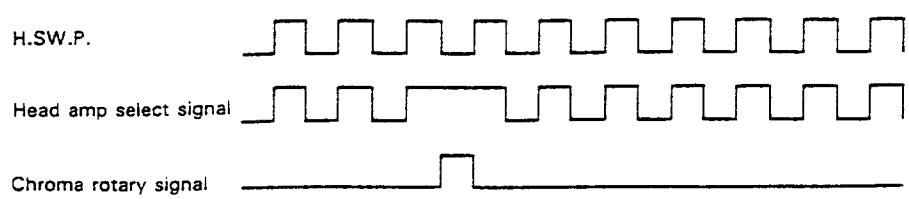

Input voltage Vin and reference voltage Vref for individual switches

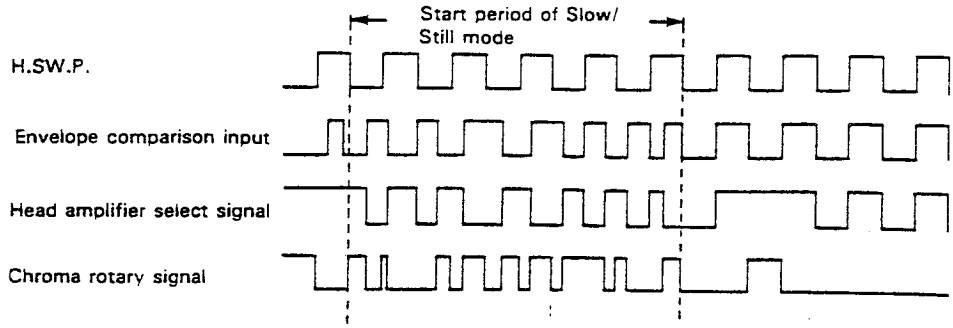
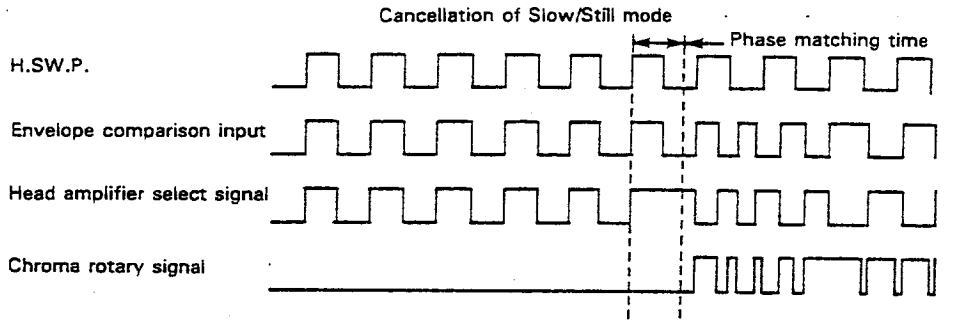
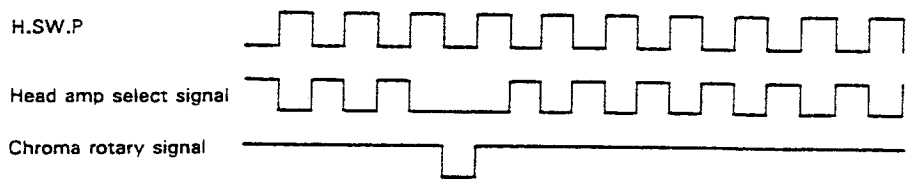
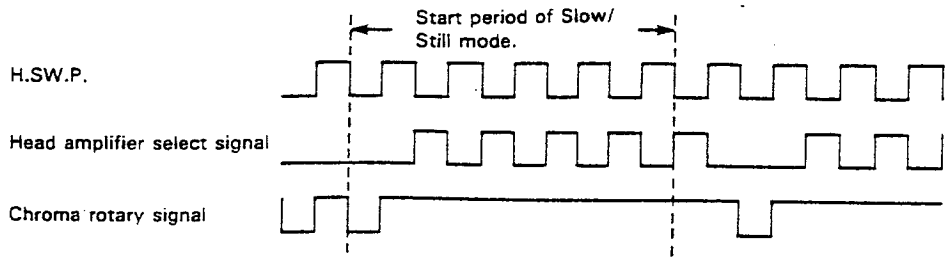
**(CASSETTE CTL/REC TIP input)**

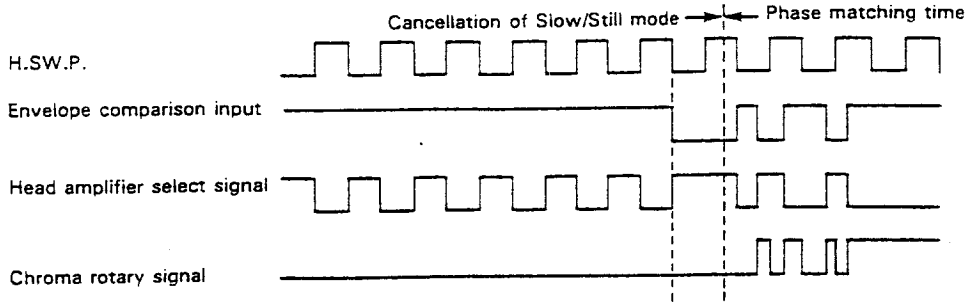
- Timing of cassette insertion and detection of REC. TIP status

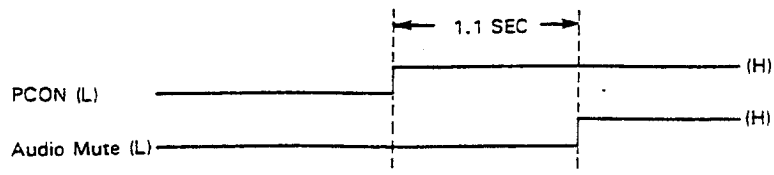
**(Cassette controller SW)**

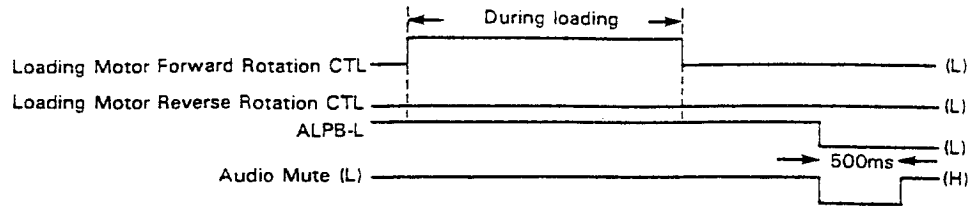
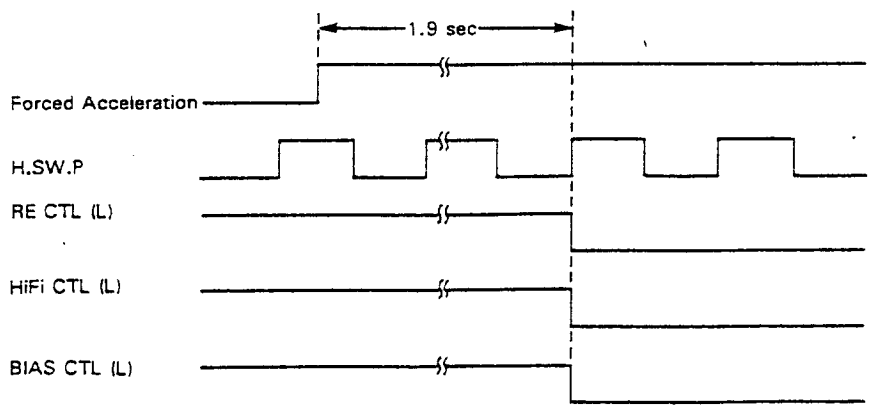
(1) Switch A detects the start of cassette insertion in slider up condition.
(2) Switch B provided for the automatic loading cassette controller is ON when a cassette is loaded in slider up condition. It is always OFF with the normal type of cassette controller.

| Pin No. | Signal name | Function |
|---|---|---|
| | | **(REC TIP SW)**<br>(1) This switch is ON when the write-protect tab (REC TIP) is broken, OFF when the tab is not broken.<br>(2) The cassette tape is ejected immediately should you attempt to start REC or TIMER REC mode when the write-protect tab (REC TIP) is broken. (This is called the tab-broken cassette automatic eject function.)<br><br>**(Speed detection input)**<br>• This input detects the tape speed data of 4H and 2H tapes.<br>(1) Refer to the paragraph titled "Description of A/D converter pins" for the relation between the input voltage levels and record mode.<br>(2) The data inputted is transferred to the timer IC as described in the following. In STOP or REC mode, the speed detection input data is regarded as invalid, and the record mode data selected by the timer is transferred as a serial signal for display. In other mode, the record mode corresponding to the voltage level inputted is transferred to the timer IC in the form of a serial signal. |
| 9 | NC | • Connected to Vdd or GND. |
| 10 | WEAK ELECTRIC FIELD (L) IN | • This pin is used to detect a weak electric field. Existence of the Hsync signal in the input video signal is identified by the signal outputted from the external Sync Detect circuit.<br>(1) When the Hsync signal is present, Weak Electric Field (L) = "H".<br>When the Hsync signal is absent, Weak Electric Field (L) = "H".<br>(2) The weak electric field (L) input is accepted at EE(L) = "L".<br>(3) If weak electric field (L) input becomes "L" when EE(L) = "L", the screen colour is made blue 120 msec later. (This is achieved by operating the OSD circuit under the control of the timer IC only when the blue background on/off switch is on.)<br>(4) In Stop condition with PCON(L) = "H", PCON(L) is made "L" level if the status Weak Electric Field = "L" last for about 30 minutes. (This sequence will not take place, however, in case execution instruction ($T_{36}$) is not received from the timer IC.) |
| 11 | HEAD AMP SELECT CTL | • The output from this pin selects SP or LP head.<br>(1) SP mode: "H"LP mode: "L"<br>(2) Head amplifier select CTL signal is "L" level in LP mode.<br>(3) Inverted envelope comparison input signal (pin 18) is outputted in VS-F/R mode.<br>(4) This pin outputs a signal in each step of Slow/Frame Advance mode according to the record mode.<br>**(SP mode)**<br>• The output from this pin is in phase with the head switching pulses during frame advance operation.<br><br>  <br> |

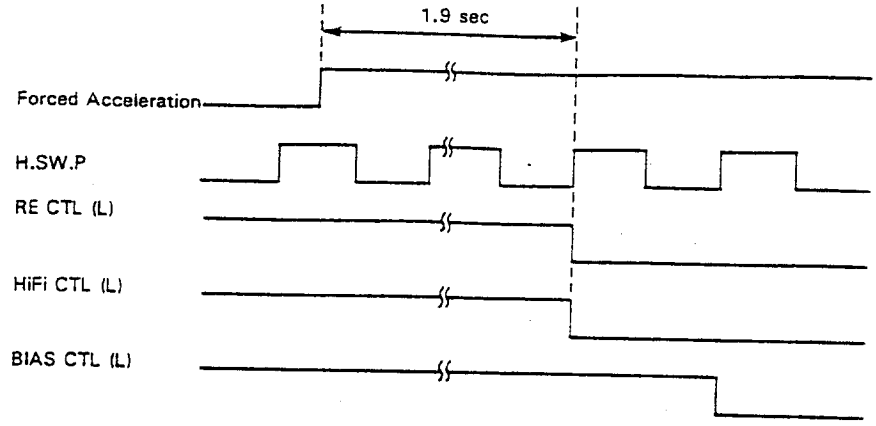
| Pin No. | Signal name | Function |
|---|---|---|
| | | • The output from this pin is in opposite phase with the envelope comparison signal during the start period of Slow/Still mode.<br>  <br><br>**Note:** The envelope comparison signal shown above is a typical waveform.<br>• The envelope comparison signal is inverted after the Slow/Still mode is canceled.<br>  <br><br>**Note:** the envelope comparison signal shown above is a typical waveform.<br>**(LP mode)**<br>• The output from this pin is in opposite phase with the head switching pulses during frame advance operation.<br>  <br><br>• The timing chart shown below applies to the start period of Slow/Still mode.<br>  <br> |

| Pin No. | Signal name | Function |
|---|---|---|
| | | • The envelope comparison signal is inverted after the Slow/Still mode is cancelled.<br>  <br><br>**Note:** The envelope comparison signal shown above is a typical waveform. |
| 12 | CHROMA ROTARY SELECT | • This pin select the chroma signal<br>(1) Right channel: "H" (Right 6° azimuth head side)<br>(2) EXOR logic for head switching pulses and head amplifier select signal |
| 13 | BEEP SOUND OUTPUT (Confirms each press of a control key) | • This output determines the duration of a beep sound which confirms each press of a control key.<br>• Beep ON period: "H" level<br>• Beep OFF period: "L" level<br><br>**<System controller>**<br>(1) A confirmation beep sound is outputted for a period of 47 msec.<br>(2) A confirmation beep sound is outputted when a key input signal is received from any of the following keys:<br>POWER key — REC key<br>EJECT key — PAUSE key<br>STOP key — REW key<br>FF key — SLOW (+)/(−) key<br>PB key — TRACKING (+)/(−) key<br>FA key — DOUBLE SPEED key<br>A-DUB key — INSERT key<br>When timer LED lights.<br><br>**<Timer>**<br>A confirmation beep sound is outputted only when the timer serial data contains a buzzer request.<br>(1) A confirmation beep sound is outputted for a period of 47 msec or 1 sec.<br>(2) A 47 msec beep sound is outputted when the timer serial data contains a 47 msec short beep buzzer request "1".<br>(Refer to the technical information on the timer for the control keys outputting a short beep buzzer request.) |
| 14<br>15<br>16<br>17 | SYSTEM CONTROLLER READY (L)<br>TIMER SERIAL DATA<br>SYSTEM CONTROLLER SERIAL DATA<br>TIMER SERIAL CLOCK | • These pins output the signals which control serial data transfer between the timer IC and system controller IC.<br>(1) The TIMER READY (L) signal is made "L" level every 23.4 msec to perform 8 bits x 5 bytes signal transfer.<br>(2) To perform serial transfer, the serial data is set at the leading edge of the serial clock after the TIMER READY (L) signal has been made "L" level. Then, the timer serial data is inputted at the trailing edge of the serial clock, and upon completing input of 8-bit data, the TIMER READY (L) signal is made "H" level.<br>(3) The TIMER READY (L) signal is kept at "H" level for a minimum period of 1 msec. |

| Pin No. | Signal name | Function |
|---|---|---|
| 18 | ENVELOPE COMPARISON INPUT | • This signal, outputted from the head amplifier module, is used as a reference signal for the head amplifier switching and chroma rotary switching outputs. The head amplifier switching and chroma rotary switching outputs are controlled with reference to the envelope comparison input in each mode. |
| 19 | P CON (L) | • This signal controls the power supply for the tape drive mechanism.<br>(1) Pressing the POWER key in power-off condition makes the PCON(L) signal "L" level. The POWER key is disabled, however, in timer standby mode.<br>(2) Pressing the POWER key in ON mode makes the PCON(L) signal "H" level. However, the PCON(L) signal is kept at the "L" level in case the mechanism is operating, and is made "H" level at the following position of the mechanism:<br>• Stop position (Loading motor is operating.)<br>• Slider up position (Cassette motor is operating.)<br>(3) When timer start data is detected in the timer serial data in timer standby mode, the PCON(L) signal is made "L" level and turns on the REC display. (Timer recording starts.)<br>(4) The PCON(L) signal is made "H" level when timer standby mode is selected. However, the PCON(L) signal is made "L" level in VPS interrupt mode.<br>(5) If PCON(L) = "H" when the loading motor, cassette motor or capstan motor is driven, the PCON(L) signal is made "L" level. It is made "H" level again at the end of motor driving period.<br>(6) If the status Weak Electric Field (L) Input = "L" lasts 30 minutes when EE(L) = "L" and PCON(L) = "L", the PCON(L) signal is automatically made "H" level to activate the automatic power-off function. |
| 20 | EE (L) | • This signal selects the EE or playback (PB) picture.<br>(1) The EE signal determines whether the EE or PB video/audio output is selected. When EE(L) = "L", the tuner input or external input signal (EE picture) is switched to the signal fed from the video head (PB picture).<br>(2) If PB-REC position is selected in PB mode when EE(L) = "L", the EE(L) signal is made "H" level about 1 second after the capstan motor has rotated in the forward direction.<br>(3) The EE(L) signal is turned to "L" level when PB mode is cancelled.<br>(4) The EE(L) signal is made "L" level when the unit is set to insert mode or insert pause mode. |
| 21 | AUDIO MUTE (L) | • This pin outputs a signal which mutes the audio output.<br>(1) The AUDIO MUTE (L) signal is made "L" level whenever the PCON(L) signal is "H" level.<br>(2) At power-on,<br>  |

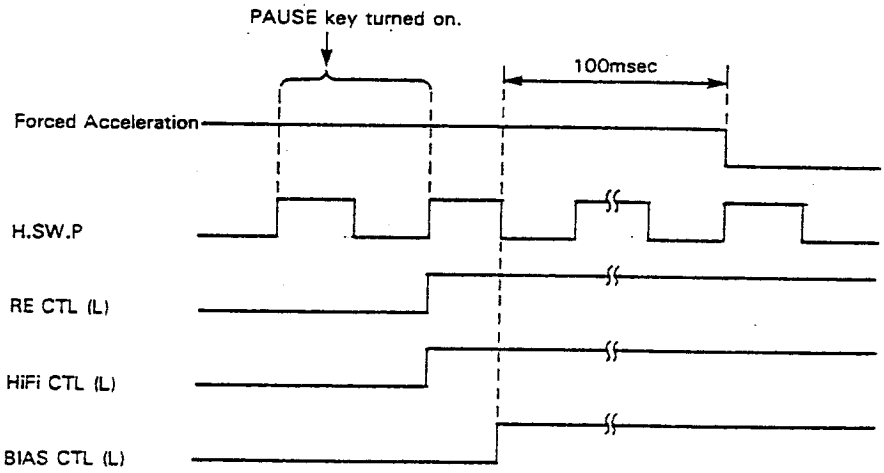
| Pin No. | Signal name | Function |
|---|---|---|
| | | (3) At the end of loading in PB mode,<br>  <br><br>(4) When the Trick Playback key is turned on in PB mode, the AUDIO MUTE (L) signal is made "L" level immediately to start trick playback mode.<br>(5) When trick playback mode (Still, Slow, VSF, VSR or Double Speed) is cancelled, the AUDIO MUTE (L) signal is made "H" level in about 500 msec in Still or Slow mode (1400 msec in VSF, VSR or Double Speed mode) after the mechanism has been put to PB mode.<br>(6) When PB mode is cancelled in the status EE(L) = "H", the AUDIO MUTE (L) signal is turned to "L" level for a period of 500 msec. |
| 22 | ALPB (L) | • This signal switches between REC mode and PB mode.<br>(1) If PB-REC position is selected in PB mode (Playback, Still, slow, VS-F/R or Double Speed), the ALPB(L) signal is made "L" level.<br>(2) The ALPB(L) signal is turned to "H" level when PB mode is cancelled. |
| 23 | BIAS CTL (L) | • This signal controls start and end timing of video signal recording.<br>(1) Recording and inserting timing is described in (1), (2), (3) and (4) of the HiFi CTL signal.<br>(2) When the PB key is pressed in REC mode, the BIAS/HiFi CTL signals are set for the timing of PB mode 100 msec after completing the process described in (2) of the HiFi CTL signal. |
| 24 | HiFi CTL (L) | • This signal controls start and end timing of HiFi audio signal recording.<br>(1) The timing charts shown below describe the start timing of REC mode after loading the cassette.<br>**(SP mode)**<br>  <br> |

| Pin No. | Signal name | Function |
|---|---|---|
| | | **(LP mode)** |

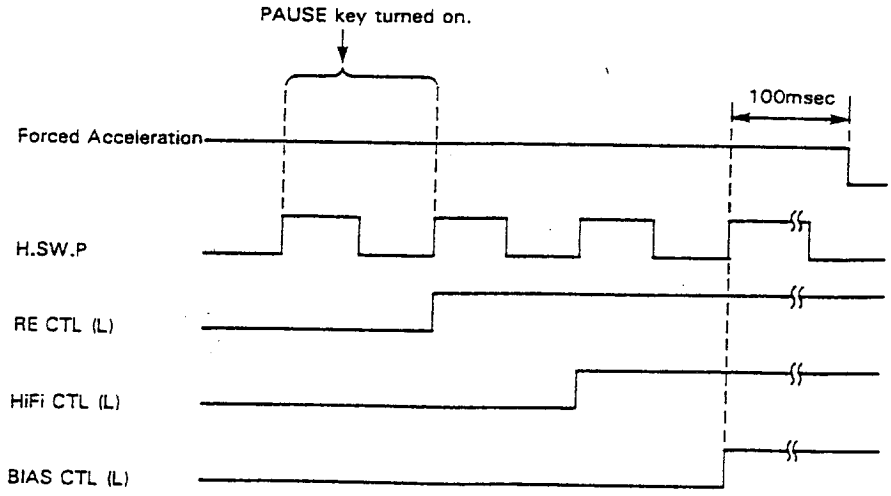


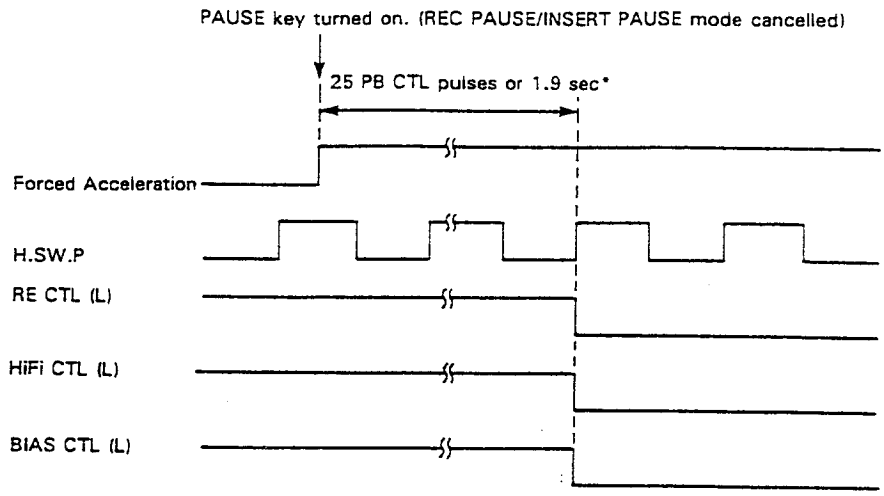
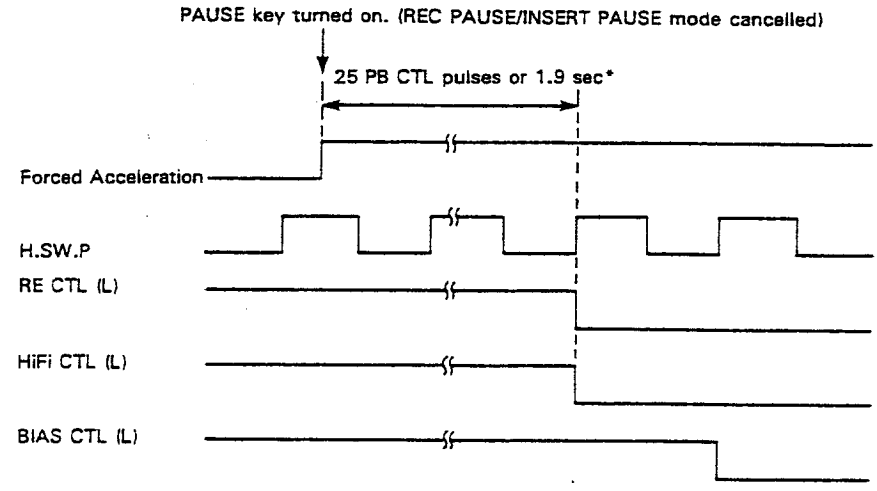

(2) Start timing of REC PAUSE and INSERT PAUSE modes is described in the following timing charts.

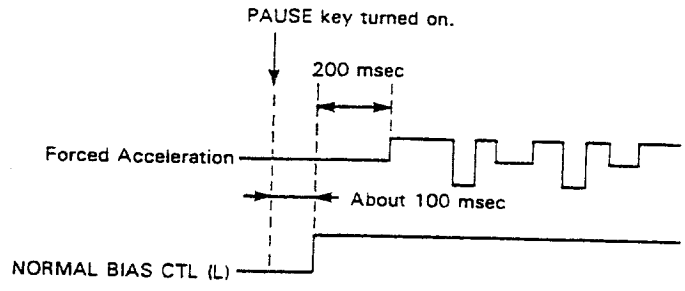
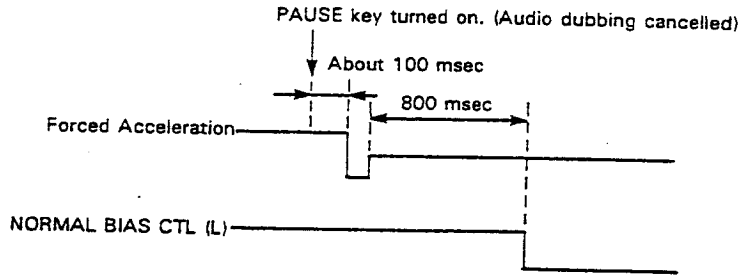
**(SP mode)**




**(LP mode)**



| Pin No. | Signal name | Function |
|---|---|---|
| | | (3) Timing of cancelling REC PAUSE and INSERT PAUSE modes is described in the following timing charts.<br><br>**(SP mode)**<br>  <br><br><br>**(LP mode)**<br>  <br><br><br>* This period is determined by the number of PB CTL pulses or the lapsed time whichever reaches the specified value.<br><br>(4) Timing of REC mode cancellation and INSERT mode cancellation is same as (2) above.<br>• This signal is used to compensate for the fluctuation of picture in PB STILL mode. The HiFi CTL (L) signal is made "L" level in PB STILL mode. |
| 25 | NORMAL BIAS CTL (L) | • This signal controls start and stop timing of recording the normal audio signal.<br>(1) The NORMAL BIAS CTL (L) signal is made "L" level in REC mode and when dubbing the audio signal.<br>(2) Start/stop timing is same with the BIAS CTL (L) signal in REC mode. |

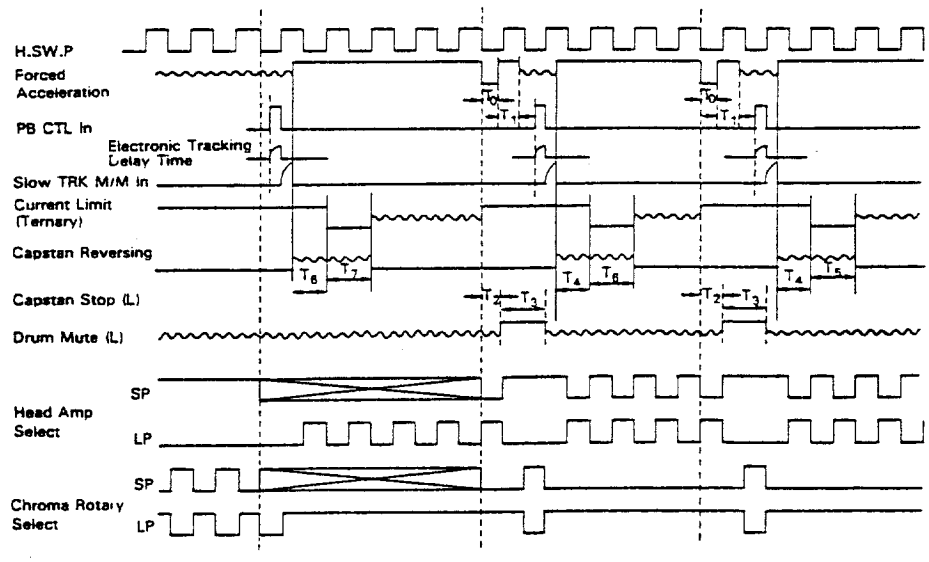
| Pin No. | Signal name | Function |
|---|---|---|
| | | (3) Audio dubbing timing is shown in the following.<br>(i) Audio dubbing pause timing is shown by the following timing chart.<br>  <br><br>(ii) Audio dubbing pause reset timing is shown by the following timing chart.<br>  <br><br>(5) Timing of cancelling audio dubbing mode is same as (i) above. |
| 26 | RE CTL (L) | • This signal controls the rotary erase signal and full-track erase signal.<br>(1) The RE CTL (L) signal is made "L" level in REC mode and INSERT mode.<br>(2) Signal timing in REC mode and INSERT mode is shown in (1),(2),(3) and (4) of HiFi CTL signal. |
| 27 | COUNTER CTL | • This pin outputs a control signal to the timer IC indicating the direction of tape travel.<br>(1) COUNTER CTL = "H": Reverse travel of tape<br>COUNTER CTL = "L": Forward travel of tape<br>(2) Tape travel direction is same as the turning direction of the capstan motor except in the following modes. Namely, the COUNTER CTL signal is made "H" level when the CAPSTAN REVERSE signal is "H" level.<br>• Cue sound muting at FF/REW Stop, etc. (Idler swing)<br>• Idler swing<br>• Reversing brake period when cancelling VS mode<br>(3) In the following modes, the COUNTER CTL signal is set as indicated below to match indication of the real-time counter with the direction of tape travel.<br>• At loading: COUNTER CTL = "L"<br>• At eject position: COUNTER CTL = "L" |
| 28 | CAPSTAN REVERSING | • This pin outputs a control signal which determines the turning direction of the capstan motor. It determines the operating mode in combination with the FORCED ACCELERATION signal outputted from pin ㉞. |

<table>
<tr><th>Pin No.</th><th>Signal name</th><th>Function</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Control signal / Mode</th><th>Forced acceleration</th><th>Reverse rotation of capstan motor</th></tr>
<tr><td>Capstan motor stopped</td><td>L</td><td>L</td></tr>
<tr><td>Forward rotation of capstan motor</td><td>Z or H</td><td>L</td></tr>
<tr><td>Reverse rotation of capstan motor</td><td>Z or H</td><td>H</td></tr>
</table>
(Z: High impedance condition)
</td></tr>
<tr><td>29</td><td>CAPSTAN PU (L)</td><td>• This pin outputs a signal which controls the reel turning torque.<br>(1) The CAPSTAN PU (L) signal, which controls the capstan motor torque control voltage, is outputted at the following timing:<br>i) When transferring from PB-REC position to VSR position<br>ii) When returning from VSR position to PB-REC position<br>iii) When the idler is shifted (swing operation)<br>iv) When the idler is shifted upon removing tape slack immediately after insertion of a cassette<br>v) When the idler is shifted at mode change from REC to REC-PAUSE</td></tr>
<tr><td>30</td><td>CAPSTAN UL (L)</td><td>• This pin outputs a signal which controls the reel turning torque in the following operations:<br>(1) The CAPSTAN UL (L) signal is a torque control voltage to be applied to the capstan motor. It is made "L" level during tape unloading, at the start FF and REW modes, and at tape tightening when ejecting a cassette.<br>i) When STOP, FF or REW mode starts at PB-REC position, the capstan motor is rotated in the reverse direction for about 500 msec. Then, the CAPSTAN UL (L) signal is made "L" level to further rotate the capstan motor in the reverse direction. The CAPSTAN UL (L) signal is made "H" level at the brake release position to stop the capstan motor.<br>ii) If the FF key is pressed at the FF-REW position, the FF mode indication is turned on and the brake is released. Then, the CAPSTAN UL(L) signal is made "L" level allowing the capstan motor to rotate in the forward direction. The CAPSTAN UL (L) signal is made "H" level about 500 msec later.<br>iii) If the REW key is pressed at the FF-REW position, the REW mode indication is turned on and the brake is released. Then, the CAPSTAN UL (L) signal is made "L" level allowing the capstan motor to rotate in the reverse direction. The CAPSTAN UL (L) signal is made "H" level about 500 msec later.<br>(2) When tape slack has been detected or when rewinding the leader tape, the CAPSTAN UL (L) signal is made "L" level for about 500 msec to start tape running. If, however, tape rewind operation is completed within 500 msec, the CAPSTAN UL (L) signal is made "H" level immediately.<br>(3) Idler shifting at the start of loading operation.<br>(4) Removal of tape slack immediately after inserting a cassette. (300 msec)<br>(5) Removal of tape slack before ejecting a cassette.<br>(6) Removal of tape slack when changing the mode from FF to STOP.</td></tr>
<tr><td>31</td><td>NC</td><td>• Connected to Vdd.</td></tr>
<tr><td>32</td><td>Vdd</td><td>• Vdd terminal</td></tr>
</table>

| Pin No. | Signal name | Function |
|---|---|---|
| 33 | CURRENT LIMIT | • This output limits the torque (or current) to be applied to the capstan motor.<br>(1) When PCON(L) = "H", the CURRENT LIMIT output is "L" level.<br>(2) When PCON(L) = "L",<br>i) CURRENT LIMIT = "Z" in Still Picture Playback mode.<br>ii) Refer to frame advance timing chart for Slow/Frame Advance mode.<br>iii) CURRENT LIMIT = "H" is outputted in other modes than above. |

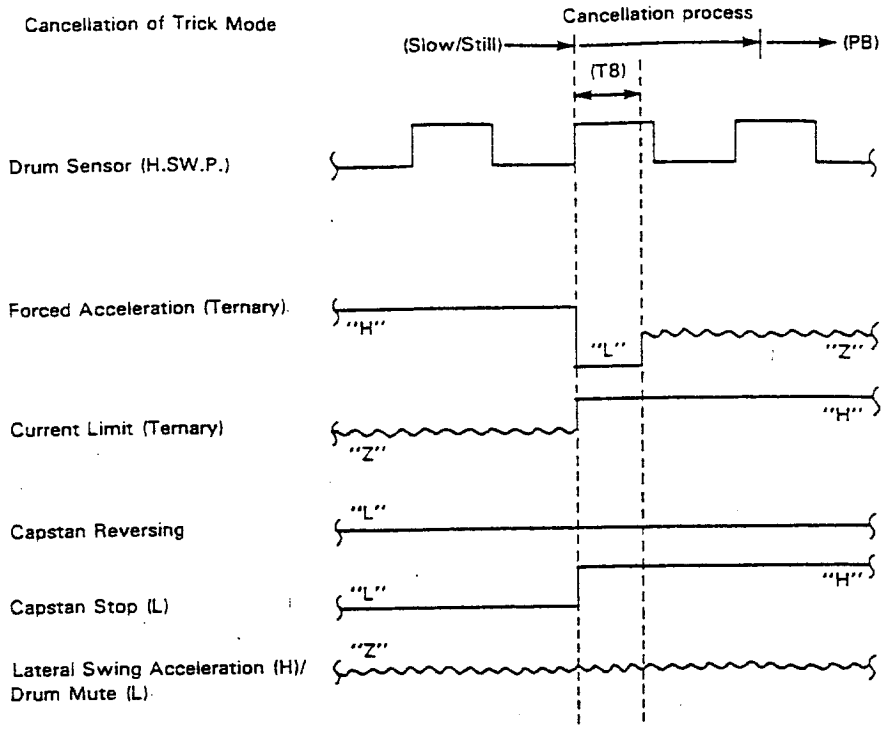
| Symbol | | Item | Setting (msec) | |
|---|---|---|---|---|
| | | | SP | LP |
| Frame advance operation | $T_0$ | Start M/M | 14.08 | 10.50 |
| | $T_1$ | Forced acceleration M/M | 19.71 | 13.04 |
| | $T_2$ | Lateral swing acceleration start time | 20.74 | 22.00 |
| | $T_3$ | Lateral swing acceleration M/M | 49.91 | 26.37 |
| | $T_4$ | Deceleration M/M | 12.29 | 7.42 |
| | $T_5$ | Brake M/M | 12.80 | 3.84 |
| | $T_6$ | Deceleration M/M (At start of Still mode) | 12.29 | 8.19 |
| | $T_7$ | Brake M/M (At start of Still mode) | 12.80 | 3.84 |
| Cancellation | $T_8$ | Cancellation of forced acceleration | 27.65 | 12.80 |

**Slow/Still frame advance timing chart**

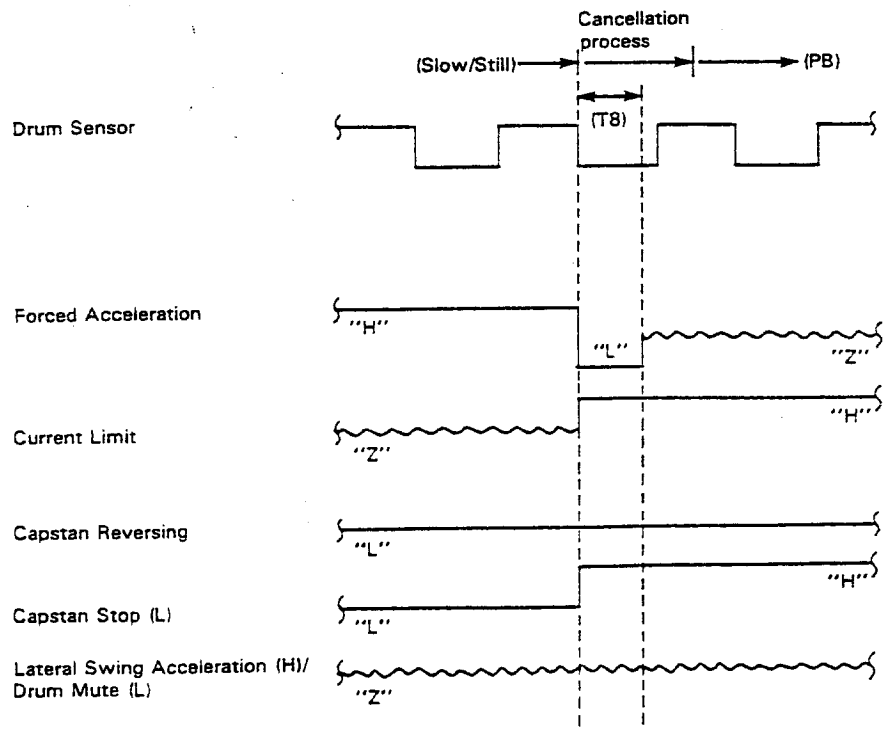


| Pin No. | Signal name | Function |
|---|---|---|

Cancellation of Trick Mode

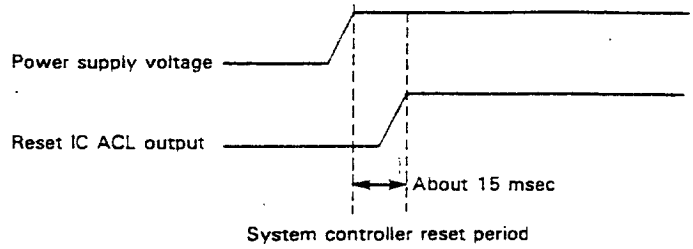
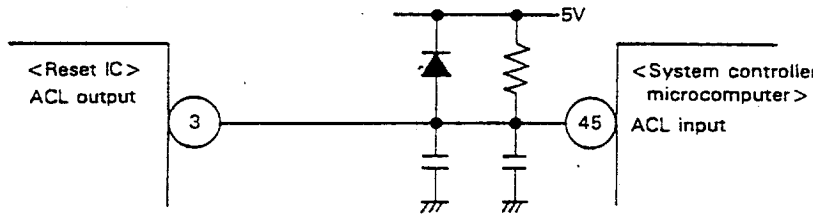
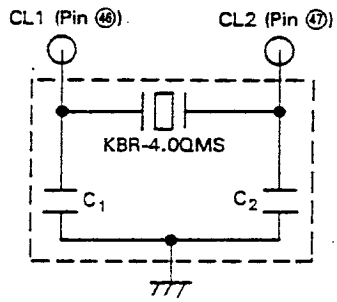
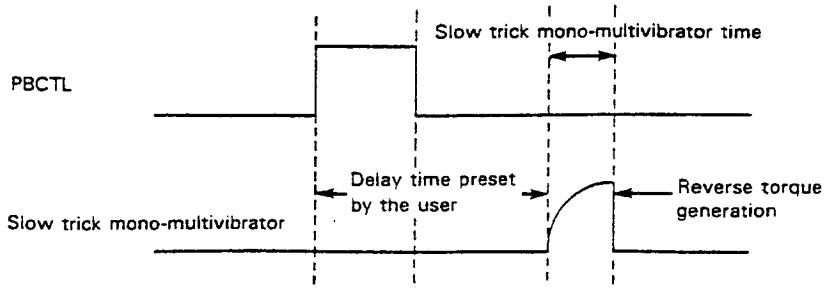


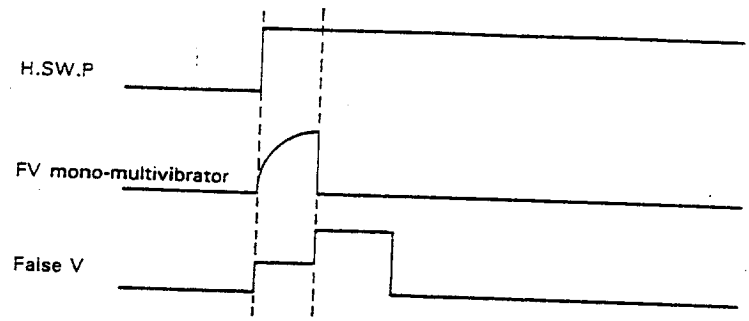
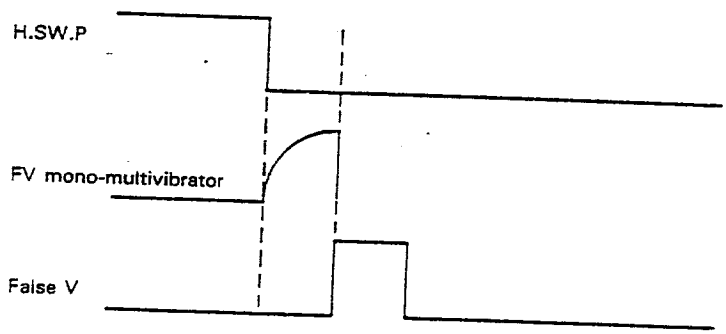
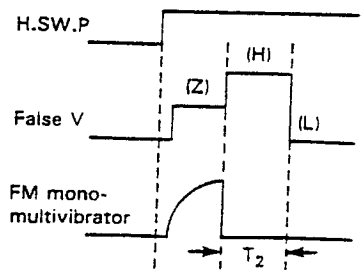
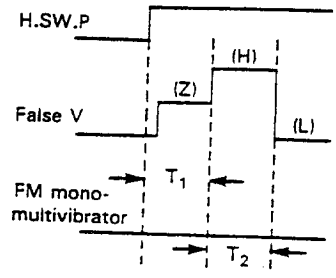

[SP mode]

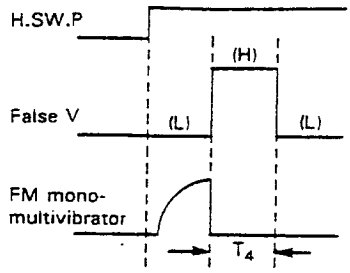
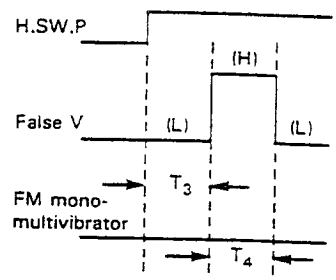



[LP mode]

<table>
<tr><th>Pin No.</th><th>Signal name</th><th>Function</th></tr>
<tr><td>34</td><td>FORCED ACCELERATION</td><td>• This output accelerates (or stops) the rotation of the capstan motor.<br>(1) In Slow/Still mode<br>i) FORCED ACCELERATION = "H" in still Picture Playback mode.<br>ii) Refer to frame advance timing chart for Slow/Frame Advance mode.<br>(2) In other modes than Slow/Still mode<br>i) FORCED ACCELERATION = "Z" when the capstan motor is rotating.<br>ii) FORCED ACCELERATION = "L" when the capstan motor is stopped.</td></tr>
<tr><td>35</td><td>DRUM MUTE (L)</td><td>• This signal controls the rotation of the drum motor. The drum motor is stopped when the DRUM MUTE (L) signal is "L" level.<br>(1) If PB, VSR, VSF, Still, Slow, Double Speed or REC mode is displayed at the FF/REW position, the DRUM MUTE (L) signal is made "Z" level, and loading is started 500 msec later.<br>(2) If Stop, FF or REW mode is displayed at the PB/REW position, unloading is started. The DRUM MUTE (L) signal is made "L" level upon completion of the unloading process.<br>(3) Refer to the frame advance timing chart for lateral swing acceleration in Slow/Still mode.<br>(4) The DRUM MUTE (L) signal is made "Z" level and the drum is rotated if PCON(L) = "L" in condensing condition.</td></tr>
<tr><td>36</td><td>INSERT (L)</td><td>• This signal turns on the Insert mode indication and interrupts the full-track erase signal.<br>(1) The INSERT (L) signal is made "L" level in Insert and Insert Pause modes.<br>(2) This pin selects the insert and audio dubbing functions. After initialization, the level at this pin is checked every 1.3 msec. The intended mode is identified when the same level has been detected 16 times consecutively.
<table>
<tr><th>Pin level</th><th>Selection of function</th></tr>
<tr><td>H</td><td>Insert or audio dubbing function is enabled.</td></tr>
<tr><td>L</td><td>Insert or audio dubbing function is prohibited.</td></tr>
</table></td></tr>
<tr><td>37</td><td>NC</td><td>• No connection</td></tr>
<tr><td>38<br><br>39</td><td>SERVO SERIAL CLOCK<br><br>SERVO SERIAL DATA</td><td>(Servo IC)<br>Data transfer to the servo IC is performed in the following manner. The servo IC outputs 21-bit data so that the mode serial data can be latched at the rising edge of the mode serial clock. The serial data output is finished by making the mode serial data "H" level at the falling edge of the last clock pulse.</td></tr>
<tr><td>40</td><td>NC</td><td>• No connection</td></tr>
<tr><td>41</td><td>SEARCH (L)</td><td>• This is a control signal which selects the gain of the PB CTL signal.</td></tr>
<tr><td>42</td><td>NC</td><td>• No connection<br>• This pin selects the digital function. After initialization, the level at this pin is checked every 1.3 msec. The function select command is identified when the same level has been detected 16 times consecutively.
<table>
<tr><th>Pin level</th><th>Selection of function</th></tr>
<tr><td>H</td><td>The digital function is enabled.</td></tr>
<tr><td>L</td><td>The digital function is prohibited.</td></tr>
</table></td></tr>
</table>

| Pin No. | Signal name | Function |
|---|---|---|
| 43 | NC | • No connection |
| 44 | NC | • No connection |
| 45 | $\overline{\text{ACL}}$ | This pin performs initial reset of the microcomputer when a Low level voltage is applied.     |
| 46<br>47 | CL1<br>CL2 | A system clock generating circuit of the microcomputer is built in, and the clock signal (4 MHz) is obtained by connecting a ceramic resonator as shown in the figure below.   <table><tr><td>Resonator/Capacitance C</td><td>C1</td><td>C2</td></tr><tr><td>KBR-4.0MS</td><td>33pF</td><td>33pF</td></tr></table> |
| 48 | SLOW TRK MONO-MULTIVIBRATOR | • This pin is intended for adjusting reverse torque generating timing in Slow/Frame Advance mode. A preset signal is inputted to this pin.<br>(1) This pin outputs "L" level normally.<br>(2) In Frame Advance mode, the delay time preset by the user is allowed to elapse after the rising edge of the PB CTL signal has been detected. At the end of this delay time, the pin is turned to "Z" level (high impedance) to allow input to the mono-multivibrator. When "H" level is detected, the input to the mono-multivibrator is stopped and the pin is made "L" level.  Slow trick mono-multivibrator time<br>PBCTL<br>Delay time preset by the user<br>Reverse torque generation<br>Slow trick mono-multivibrator |

| Pin No. | Signal name | Function |
|---|---|---|
| 49 | FV MONO-MULTIVIBRATOR | • This pin is intended for adjusting the delay time from a leading edge of the head switching pulse to false vertical sync signal generation.<br>(1) This pin outputs "L" level normally.<br>(2) After detecting a leading edge of the head switching pulse, the pin is turned to "Z" level (high impedance) to allow input to the mono-multivibrator. When "H" level is detected, the input to the mono-multivibrator is stopped and the pin is made "L" level.<br>**(In SP Still mode)**<br>  <br>**(In LP Still mode)**<br>  |
| 50 | FALSE V | • In Trick mode (VS-F/R), this pin generates FV/FH to achieve synchronization.<br>(1) The FV signal is generated in VS-F/R mode, during mechanism shift period when PB mode is switched to VS-R mode or when cancelling VS-R mode, during mode holding time when cancelling VS-F/R mode, in Slow/Still mode, and in Double Speed mode.<br>(2) Signal waveforms when generating the FV signal are shown below. (Note: The FV signal is generated at both the rising edge and falling edge of the head switching pulse.)<br>**Mode A (Variable FV ternary output)**<br>  <br>**Mode B (Fixed FV ternary output)**<br>  |

| Pin No. | Signal name | Function |
|---|---|---|
| | | **Mode C (Variable FV binary output)**<br>  <br><br>**Mode D (Fixed FV binary output)**<br>  <br><br>**Note:** (Z: High impedance)<br>(3) Modes and output waveforms are tabulated below: |

| Mode | Recording Mode | H.SW.P | |
|---|---|---|---|
| | | Rising Edge | Falling Edge |
| VS-F/R | SP<br>LP | B mode<br>D mode | B mode<br>D mode |
| STILL/SLOW | SP<br>LP | A mode<br>D mode | B mode<br>C mode |
| Double Speed | SP<br>LP | B mode<br>D mode | A mode<br>C mode |

(3) Period of each time segment of the false V waveform is tabulated below for each mode:

| Mode | H.SW.P | SP Mode ($\mu$sec) | | LP Mode ($\mu$sec) | |
|---|---|---|---|---|---|
| | | $T_1$ | $T_2$ | $T_3$ | $T_4$ |
| SLOW/STILL (Period of intermediate speed) | Rising edge | — | 295 | 280 | 300 |
| | Falling edge | 385 | 295 | — | 290 |
| SLOW/STILL (Other period than above) | Rising edge | — | 295 | 282 | 300 |
| | Falling edge | 305 | 295 | — | 300 |
| Double Speed | Rising edge | 290 | 295 | 280 | 300 |
| | Falling edge | — | 295 | — | 300 |
| VS-F/R | Rising edge | 290 | 295 | 265 | 300 |
| | Falling edge | 290 | 295 | 240 | 300 |
| **Note:** Jitter of the FV signal at output timing is 32 $\mu$sec at the maximum. | | | | | |

| | | |
|---|---|---|
| 51 | FV CTL | • This is a control pin for the H compensation circuit operated in trick mode.<br>(1) The FV CTL signal is made "H" level in Still, Slow, Double Speed, VSF and VSR modes.<br>(2) The FV CTL signal is made "L" level after the following waiting time since trick mode has changed to playback:<br>• Still and Slow modes: 500 msec<br>• VSF and VSR modes: 1400 msec<br>• Double Speed mode: 800 msec |

| Pin No. | Signal name | Function |
|---|---|---|
| 52 | GND CTL | • This pin outputs a signal which controls the negative terminal of the control head.<br>(1) In REC mode, the GND CTL pin is made "L" level 100 msec after the BIAS CTL (L) signal is made "L" level.<br>(2) The GND CTL pin is made "H" level immediately when the BIAS CTL (L) signal is made "H" level.<br>(3) This pin is kept at "H" level normally. |
| 53 | NC | • No connection |
| 54 | NORMAL AUDIO MUTE (H) | • This is a control signal which mutes the normal sound record/playback signal.<br>(1) This pin does not accept the mute request from the timer IC.<br>(2) When switching from VSF or VSR mode to playback mode, the NORMAL AUDIO MUTE (H) signal is made "L" level about 1400 msec after the mechanism has shifted to the Playback mode position. When other Trick Playback mode is cancelled, the NORMAL AUDIO (H) signal is made "L" level immediately after the mechanism has shifted to the Playback mode position.<br>(3) In other cases than above, the NORMAL AUDIO MUTE (H) signal is set to the same level as the AUDIO MUTE (L) signal at pin ㉑. (Polarity is reversed.) |
| 55 | NORMAL EE (L) | • This signal switches normal audio output between line in audio signal and playback audio signal.<br>(1) The NORMAL EE (L) signal is made "L" level during audio dubbing and audio dubbing pause.<br>(2) The NORMAL EE (L) signal is made "H" level during insert mode and insert pause.<br>(3) This signal is set to the same level as the EE (L) signal at pin ⑳. |
| 56 | END SENSOR IN | • This signal detects the tape end.<br>(1) When the rising edge of the END SENSOR input is detected<br>i) If the unit is in ON mode with a cassette inserted, the cassette is automatically rewound.<br>ii) If the unit is in Timer REC mode, the cassette is ejected after the leader tape is rewound.<br>(2) If the unit is in Stop mode, the tape is rewound until the END SENSOR input becomes "L" level to take up the leader tape. If, however, the END SENSOR input does not becomes "L" level while the tape is rewound for a period of 5 sec, tape rewind operation is stopped.<br>(3) "Cassette down" condition is detected by the END SENSOR input and the START SENSOR input described below when the following status has occurred:<br>(Cassette controller down)•((End sensor)+(Start sensor))="H" |
| 57 | START SENSOR IN | • This signal detects the tape start.<br>(1) When the rising edge of the START SENSOR input is detected<br>i) The tape is stopped if the unit is in REW mode.<br>ii) If the unit is executing REC/PAUSE short rewind operation, short rewinding is interrupted.<br>(2) If the unit is in Stop mode, the tape is rapidly advanced until the START SENSOR input becomes "L" level to take up the leader tape. If, however, the STOP SENSOR input does not becomes "L" level while the tape is rapidly advanced for a period of 5 sec, fast forward operation is stopped.<br>(3) The START SENSOR input is utilized to identify the "cassette down" condition. Refer to the description of the END SENSOR input. |

<table>
<tr><th>Pin No.</th><th>Signal name</th><th>Function</th></tr>
<tr><td>58</td><td>REEL SENSOR IN</td><td>• This is a sensor input for detecting the reel disk situation in which the reel disk should rotate.<br>(1) The situations in which the reel disk should rotate are as follows:<br>i) When tape loading is already completed<br>• PB<br>• REC<br>• VSF<br>• VSR<br>• Double-Speed<br>ii) When tape unloading is already completed<br>• FF<br>• REW<br>(2) Disk rotation is stopped if the REEL SENSOR input does not change within the time specified for each mode in the Table below:<br><table><tr><th>Mode</th><th>Shutoff time</th></tr><tr><td>SP-PB SP-REC<br>FF REW Double-Speed x1.5 Speed</td><td>5.0 sec</td></tr><tr><td>LP-PB LP-REC</td><td>10.0 sec</td></tr><tr><td>VSR VSF</td><td>1.2 sec</td></tr></table>(3) Tape slack is detected by counting the pulse edges of the REEL SENSOR input.</td></tr>
<tr><td>59</td><td>DEW SENSOR IN</td><td>• This is an input terminal for the signal used for detection of a condensing condition.<br>(1) A condensing condition is detected and the action of the mechanism is prohibited when the DEW SENSOR input becomes "H" level. However, the following keys are effective even in a condensing condition:<br>• POWER<br>• EJECT/INSERT<br>(2) When the DEW SENSOR input becomes "H" level, the mechanism is shifted to the Eject position and the following sequence takes place:<br>The DRUM MUTE (L) signal is made "Z" level if PCON(L) = "L".<br>The DRUM MUTE (L) signal is made "L" level if PCON(L) = "H".<br>(3) When the DEW SENSOR input becomes "L" level, the mechanism is shifted to the Stop position.</td></tr>
<tr><td>60</td><td>CTL GAIN SELECT (L)</td><td>• This output selects the gain of the PB-CTL amplifier in FF/REW mode.<br>In FF/REW mode, the CTL GAIN SELECT outputs an "H" level.<br>In other modes than above, the CTL GAIN SELECT outputs an "L" level.</td></tr>
<tr><td>61</td><td>BRAKE SOLENOID</td><td>• This signal is used to control ON/OFF operation of the brake solenoid.<br>(1) This signal controls ON/OFF operation of the brake solenoid. The brake solenoid is attracted when the BRAKE SOLENOID signal is "H" level.<br>(2) Pressing the REW key at FF/REW position causes the REW indication to light up, making the BRAKE SOLENOID signal "H" level, the LOADING MOTOR FORWARD CTL signal "L" level, and the LOADING MOTOR REVERSE CTL signal "H" level. Consequently, the brake solenoid shifts to the release position.<br>(3) Pressing the FF key at FF/REW position causes the FF indication to light up, and then the same brake release operation as (2) above takes place.<br>(4) If the END SENSOR input or START SENSOR input becomes "H" level when a cassette is already inserted, the same brake release operation as (2) above takes place.</td></tr>
</table>

<table>
<tr><th>Pin No.</th><th>Signal name</th><th>Function</th></tr>
<tr><td></td><td></td><td>(5) When tape slack is detected, the same brake release operation as (2) above takes place.<br>(6) The BRAKE SOLENOID signal is made "L" level immediately before the CAPSTAN UL (L) signal is made "H" level in such cases that are described in (2), (3) and (4) of the CAPSTAN UL signal.<br>(7) The BRAKE SOLENOID signal is made "L" level immediately before FF/REW mode is cancelled.</td></tr>
<tr><td>62<br><br>63</td><td>LOADING MOTOR FORWARD CTL<br><br>LOADING MOTOR REVERSE CTL</td><td>(1) Pins ⑫ and ⑬ output the signals which control the revolving direction of the loading motor. The table below describes the actions achieved by different combinations of those signals:
<table>
<tr><th>Control signal / Mode</th><th>Loading motor forward rotation CTL</th><th>Loading motor reverse rotation CTL</th></tr>
<tr><td>Loading motor stopped</td><td>L</td><td>L</td></tr>
<tr><td>Forward rotation of loading motor</td><td>H</td><td>L</td></tr>
<tr><td>Reverse rotation of loading motor</td><td>H</td><td>H</td></tr>
</table>
(2) When the loading motor mechanism is stopped, these control signals are set as follows:<br>• LOADING MOTOR FORWARD CTL = "L"<br>• LOADING MOTOR REVERSE CTL = "L"<br>(3) The following functions are provided for overcurrent protection of the loading motor:<br>• 2.0 sec shutoff while the cassette controller is operating<br>• 7.0 sec shutoff while the loading arm is operating<br>(4) In the event of "shutoff", both the LOADING MOTOR FORWARD CTL signal and LOADING MOTOR REVERSE CTL signal are made "L" level to stop the loading motor. Then, the loading motor is kept at the halt position until any operating key input is made. If, however, a "shutoff" occurs while the cassette controller is sending the tape in the forward direction, the loading motor is reversed immediately and the cassette is ejected.<br>(5) Cassette Controller Operation<br>i) In case the cassette controller does not reach the cassette controller down position within 2 seconds when inserting a cassette, it immediately changes its moving direction back to the eject position. If the cassette controller does not return to the cassette controller up position within 2 seconds, it performs the cassette inserting process again. If it fails to reach the cassette controller IN position, a "shutoff" takes place.<br>ii) If the cassette controller does not reach the cassette controller up position within 2 seconds when ejecting a cassette, it immediately returns into the cassette inserting direction. If it does not reach the cassette controller down position within 2 seconds, a "shutoff" takes place.</td></tr>
<tr><td>64</td><td>Vss</td><td>• Vss terminal<br>Connected to GND.</td></tr>
</table>

# SOUND MULTIPLEX CIRCUIT FUNCTIONS

**1. Audio signal detection circuit**

- Detection of No. 1 SIF (main audio channel) --- Signal flow shown by red lines in the circuit diagram
- Detection of No. 2 SIF (sub audio channel) --- Signal flow shown by blue lines in the circuit diagram

No. 1 and No. 2 SIF signals flow through the above-mentioned signal lines and appears at pins ㉙ and ㉚ as audio outputs. Since this IC incorporates a de-emphasis (50 μsec), an external de-emphasis circuit is not required. Monophonic audio signal output of the tuner for linear audio signal is outputted from pin ㊴. It is passed through Q1602 (emitter follower) and finally outputted from CC pin ④.

**2. Pilot signal detection and discrimination circuits**

- Detection of pilot circuit --- Signal flow shown by green lines in the circuit diagram

Mono/Mono cancel circuit ----- In case the pilot signal is not modulated and the sub audio signal appears as a 274 Hz signal, the output at TP1601 normally contains the 54 kHz component only. However, this output is modulated by the sub audio signal frequency of 274 Hz in certain cases due to the variation in the AMR characteristics of FL1601. In case the depth of this modulation is excessive, the unit may misjudge the monophonic broadcast mode as a bilingual mode. The mono/mono cancel circuit is provided to prevent such an error. This is achieved by cancelling the effect of the sub audio signal to the pilot signal with the difference between the 54 kHz B.P.F. output signal and the signal at pin ⑪. (Refer to MONO/MONO CANCEL CIRCUIT.) The audio signal which has passed through the mono/mono cancel circuit is AM-detected and enters the phase detector through the 117.4 Hz or 274.1 Hz filter. The phase detector output has the voltage levels as listed at below depending on the broadcast mode.

Table 4-1. Phase detector outputs (TP1602)

| MODE | OUTPUT |
|---|---|
| STEREO | 1/3 Vcc or over |
| MONO | 1/2 Vcc |
| BILINGUAL | 1/3 Vcc or less |

This output controls the audio signal output of the Matrix circuit through the detector.
Operational errors of the unit in weak electric field conditions are prevented by detecting the noise level at pin ⑤. If the noise is excessive, a forced monophonic signal is outputted from the noise detector (NOISE DET) to the detector.

**3. Matrix circuit**

Signal contents of the main audio channel and sub audio channel in each broadcast mode are tabulated at below.

Table 4-2.

| Broadcast mode | Main audio signal | Sub audio signal |
|---|---|---|
| Monophonic mode | No. 1 audio signal | ——— |
| Stereophonic mode | $\frac{L+R}{2}$ | R |
| Bilingual mode | NO. 1 audio signal | No. 2 audio signal |

Pins ㉚ (L channel) and ㉙ (R channel) of IC1601 output the following signals in the respective broadcast modes:

- Monophonic broadcast: No. 1 audio signal is outputted from both pins ㉙ and ㉚.
- Stereophonic broadcast: Pin ㉚ outputs the L channel signal obtained by the processing expressed by $2 \times (L + R)/2 - R = L$. Pin ㉙ outputs the R channel sub audio signal directly.
- Bilingual broadcast: Pin ㉙ outputs the No. 2 audio signal while pin ㉚ outputs the No. 1 audio signal directly.

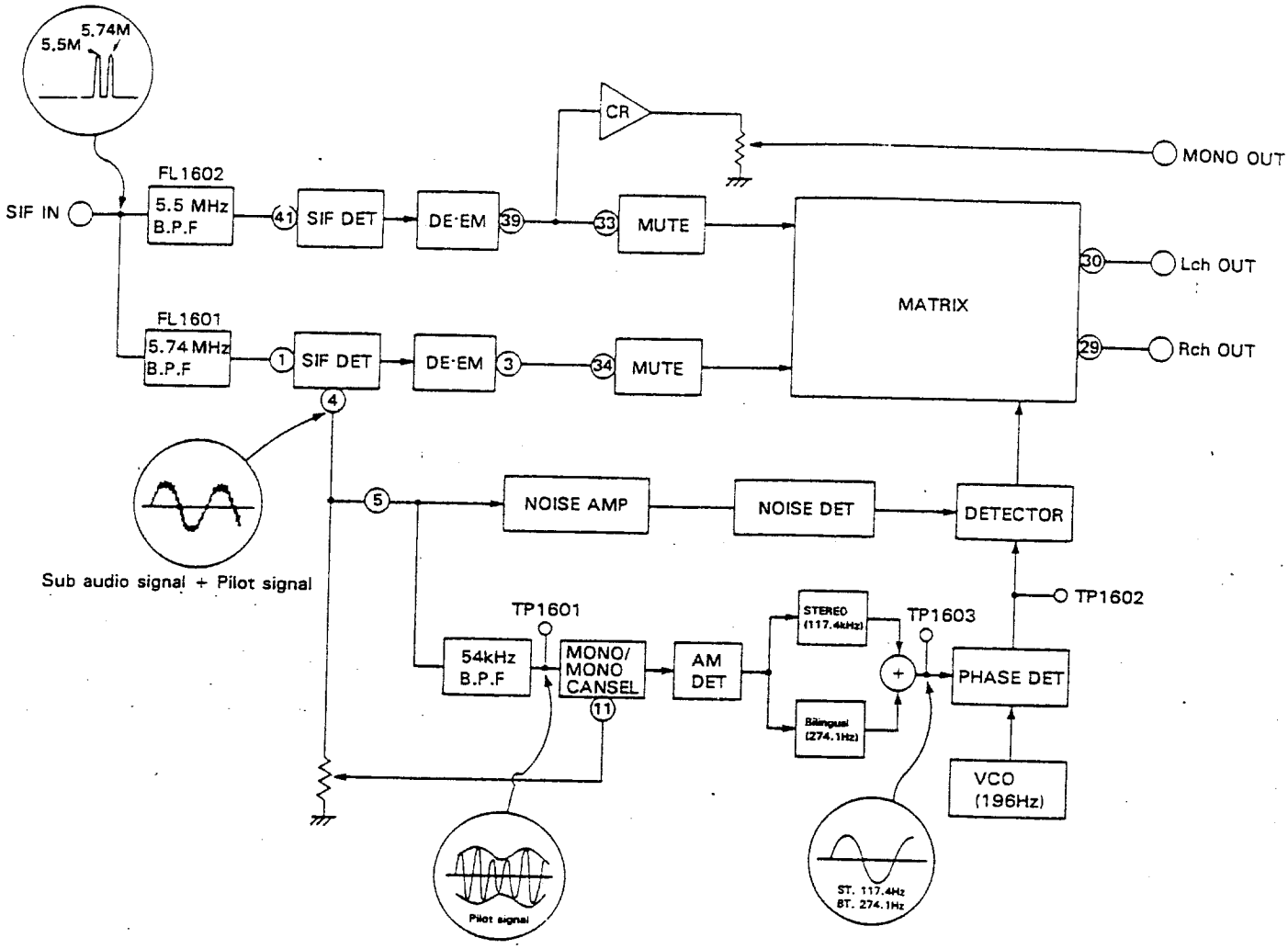



Figure 4-1. Multiplex block diagam

**Mono/mono cansel circuit**

Here, we assume that the signal shown in Figure 4-2 is inputted and FL1601 has the frequency response with an inclined top within its passband as shown in Figure 4-3. The waveform of the output signal obtained at TP1601 is amplitude-modulated by the sub audio signal frequency (Figure 4-4). The mono/mono cancel circuit is intended to prevent this modulation by the sub audio signal. The output at pin ④ is fed to pin ⑪ through R1609. The difference between the output signal of the 54 kHz B.P.F. and the signal at pin ⑪ is used to cancel the effect of the sub audio signal to the pilot signal. Since the inclination of the response curve shown in Figure 4-3 varies among individual filters, the input level to pin ⑪ is adjusted by R1609 to obtain the maximum cancellation effect.

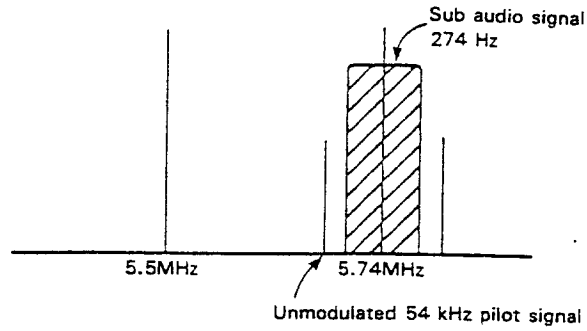



Figure 4-2.

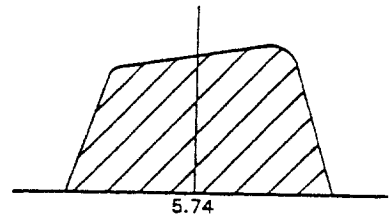



Figure 4-3.

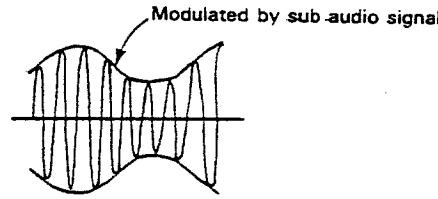



Figure 4-4.

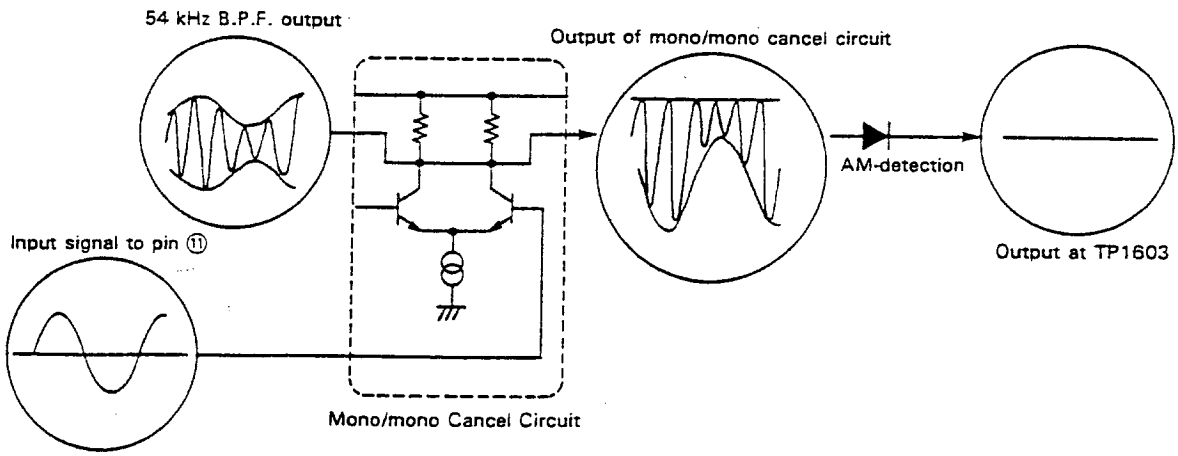


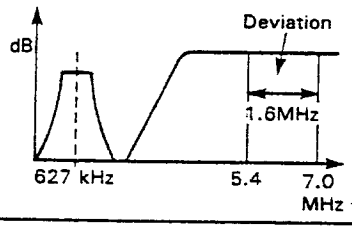
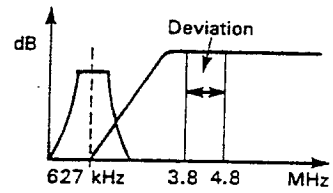

Figure 4-5.

# S-VHS SIGNAL PROCESSING CIRCUIT

## S-VHS OUTLINE

In comparison to the conventional VHS format, S-VHS offers drastically improved picture quality and resolution. The features of S-VHS are explained below.

**Table 5-1. Comparison of S-VHS and VHS**

| | S-VHS | VHS |
|---|---|---|
| Horizontal resolution | minimum 400 lines | minimum 250 lines |
| FM carrier (sync tip to white peak) | 5.4 to 7 MHz | 3.8 to 4.8 MHz |
| White clip | 110% | 80% |
| Dark clip | 70% | 40% |
| Spectrum |   |   |

## S-VHS FEATURES

### (1) Wider bandwidth (for better resolution)

1)-1 Higher frequency of luminance FM carrier
The FM carrier extends from 5.4 to 7 MHz and luminance signal deviation is 1.6 MHz, resulting in highter resolution.

1)-2 S-VHS tape
The tape uses a formulation of cobalt ferric oxide with extremely fine particles, offering superior recording characteristics up to very high frequencies. The rear fo the cassette has detection slots to permit automatic slection of tape type (VHS or S-VHS) when a cassette is inserted in teh VCR.

1)-3 Narrow video head gap
For S-VHS, frequency response must reach at least up to 8 MHz. The video head therefore has a narrower gap than in conventional VHS recorders.

### (2) Improved S/N ratio

2)-1 Larger deviation
Deviation in the S-VHS format is 1.6 MHz for improved S/N ratio and sharp picture quality.

### (3) Improved waveform fidelity

3)-1 Subemphasis circuit
A subemphasis circuit is used in order to suppress high-frquency noise of the luminance signal. (The circuit boosts the high range during recording and attenuates it during playback.)

3)-2 Improve white and dark clip
Higher white clip and dark clip levels provide noticeably better contrast.

### (4) Reduced dot interference in Y/C signal

4)-1 Separate Y/C signal input/output terminals
In VHS, the luminance and colour signal were combined in a composite signal for input and output. In S-VHS, the luminance and colour signals are treated separately. This reduces dot interference, i.e. adverse effects of the colour signal on the luminance signal. The result of this technique is improved picture quality.

4)-2 2H comb filter
For explanation of this feature, refer to the circuit description section.

**What is S-VHS?**

S-VHS is a video recording system developed to realize a higher quality picture providing a higher resolution (400 horizontal scanning lines or over) than the conventional VHS system. Features provided by the S-VHS system are as follows:

(1) Compared to the conventional VHS system, the sync tip of the FM modulating frequency for luminance signal recording is shifted to a higher frequency range, from 3.8 MHz to 5.4 MHz. This means that the recording frequency bandwidth is broadened to about 5 MHz (400 horizontal scanning lines) in S-VHS from about 3 MHz (250 horizontal scanning lines) in VHS, resulting in a higher resolution. (Refer to Figs. 5-1 and 5-2.)

(2) Deviation of frequency modulation is broadened to 1.6 MHz in S-VHS compared to 1 MHz in conventional VHS to improve the S/N ratio.

(3) S-VHS employs non-linear subemphasis in addition to the conventional emphasis process to reduce noise in high frequency range.

(4) To increase waveform reproducibility, white clip level is set to 110% and dark clip level to 70% in S-VHS.

These are the main features of the S-VHS format in luminance signal processing (which are almost same as NTSC S-VHS).

Further, S-VHS employs the pilot burst system in addition to the colour signal processing used in conventional PAL VHS to improve the S/N ratio of the colour signal and colour fade-out at the screen top. In the pilot burst system, an additional burst is inserted during the horizontal sync period of the Y/C-separated recorded colour signal. At playback, the pilot burst signal is used for executing APC operation so that the above-mentioned effect is obtained.

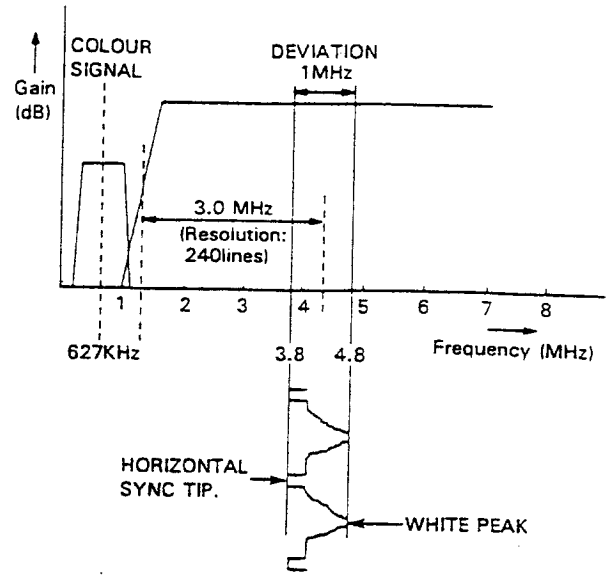



**Figure 5-1. Recording Signal Spectrum (VHS)**

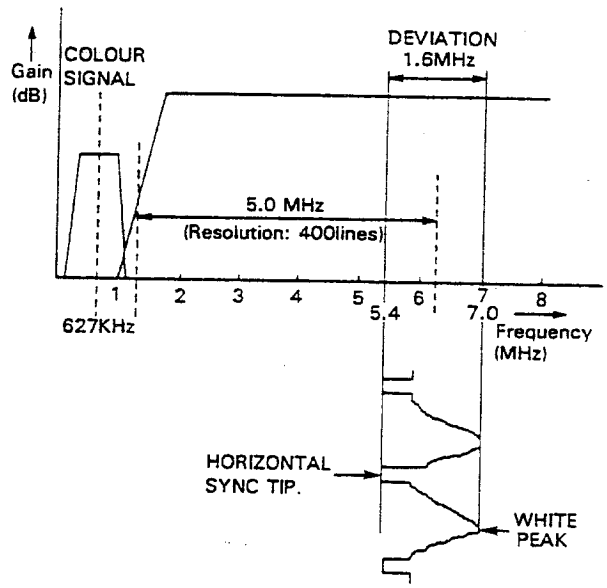



**Figure 5-2. Recording Signal Spectrum (S-VHS)**

• **Outline of pilot burst signal**

(1) The pilot burst signal having a duration of 2.26 μsec is inserted in the recorded colour signal 0.8 μsec after the leading edge of the horizontal sync signal. (Refer to Fig. 5-3.)

(2) The pilot burst signal has the same frequency with the colour subcarrier, or 4.433619 MHz.

(3) The amplitude of the pilot burst signal is same with the inputted burst signal.

(4) The pilot burst signal is also inserted in the vertical blanking section where the burst signal is absent in the input signal.

(5) The pilot burst signal is erased when the playback signal is outputted to the external circuit.

(6) Phase of the pilot burst signal is adjusted as follows depending on the recorded colour signal:

(A) +90° with respect to the U-axis when the low frequency converted colour signal contains luminance signal components.

(B) +270° with respect to the U-axis when the low frequency converted colour signal does not contain luminance signal components.

Unlike the burst signal in PAL system, the pilot burst signal is not subject to phase variations every 1H. (Refer to Fig. 5-4.) Table 5-2 gives a comparison between S-VHS and VHS summarizing the above points.

Table 5-2. Comparison of S-VHS 625 and VHS PAL

| Item \ System | S-VHS 625 | VHS PAL |
|---|---|---|
| Modulating frequency (sync tip) | 5.4 MHz | 3.8 MHz |
| Modulating frequency (white peak) | 7.0 MHz | 4.8 MHz |
| Frequency deviation | 1.6 MHz | 1.0 MHz |
| White clip level | 110% | 80% |
| Dark clip level | 70% | 40% |
| Emphasis system | Main emphasis + no New non-linear sub-emphasis | Main emphasis + Detail enhancer + Conventional non-linear subemphasis |
| Pilot burst | Provided | Not provided |
| Recorded frequency band | About 5.0 MHz | About 3.0 MHz |
| Horizontal resolution | About 400 lines | About 250 lines |

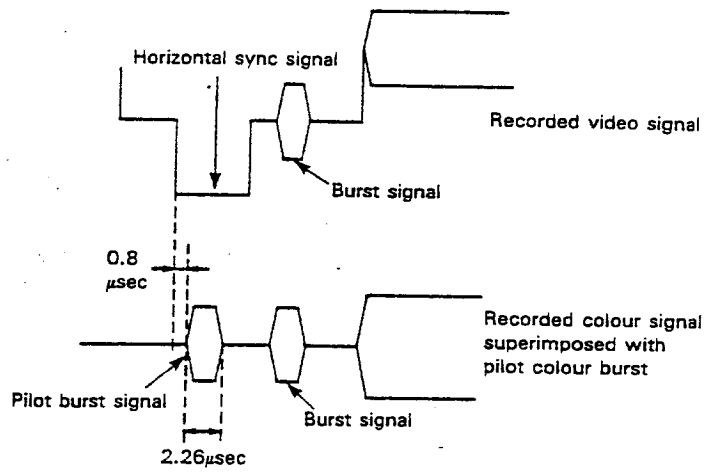
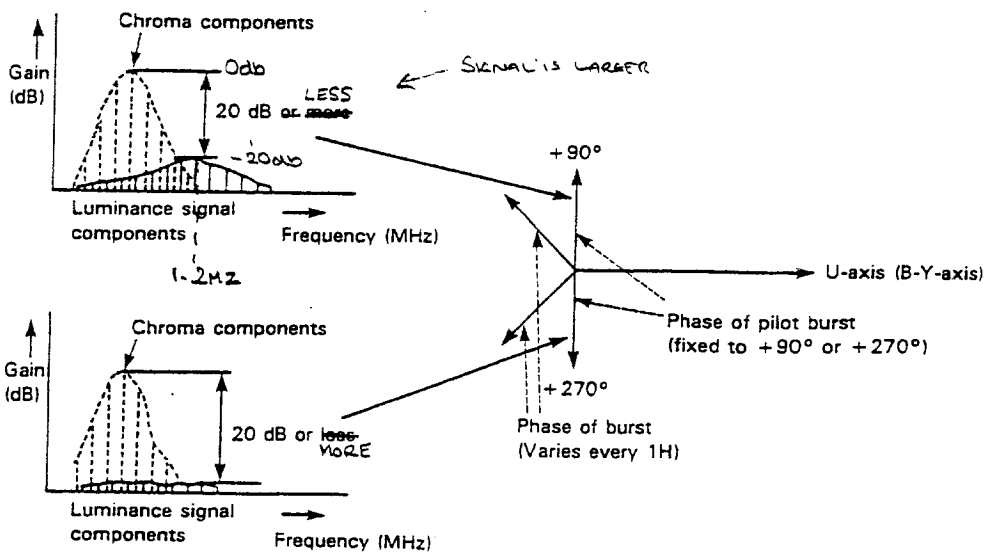



Figure 5-3. Pilot burst inserting position

When low band converted colour signal contains luminance signal components (Generally, when colour signal to be recorded is separated from composite signal through B.P.F.)

USING BPF




When low band converted colour signal does not contain luminance signal components (Generally, when colour signal to be recorded is separated from composite signal through V-type filter or when Y/C-separation terminal input is used)

USING COMB FILTER.

Spectrum of recorded low band converted colour signal

Vector diagram indicating phase of pilot burst

Figure 5-4. Phase of pilot burst

ONLY 270° PILOT BURST IS USE IN OUR CAMCORDER. IF 90° RECORDED ON ANOTHER MACHINE IT WILL STILL PLAY BACK. THIS MA USES 90°.

In addition to the afore-mentioned features of the S-VHS format,

(1) Unlike the VHS system which adopts a low pass filter for Y/C-separation, S-VHS employs a comb filter with a 2H delay line to expand the bandwidth of the recorded luminance signal.

(2) S-VHS employs a Y/C-separation i/o terminal (pin S) to reduce the interference between the luminance signal and colour signal which may be caused by the broadened bandwidth of the record/playback luminance signal.

(3) Since the wavelength of the recorded signal gets shorter due to its increased modulating frequency, the gap of the video head is narrowed to improve its response in the high frequency range.

(4) Magnetic substance formulated in extremely fine particles on the S-VHS video tape helps improve the gain in high frequency range and C/N.

## MACRO SIGNAL PROCESSING CIRCUIT

**(1) Pilot burst signal**

Major difference of S-VHS from VHS is that the pilot burst signal is added to the chroma signal when recording. Refer to the description the S-VHS system in the preceding paragraph for the reason why the pilot burst signal is added and for the specifications of the pilot burst. For pilot burst processing, the VC-S1000 series incorporates a 2-chip chroma signal processing circuit consisting of a pilot burst signal processor IC (HA118117) and main chroma signal processor IC (HA118116). Hybrid IC IC504 (RH-IZ0157GEZZ), incorporating the above-mentioned two IC's, and its peripheral circuits perform not only the chroma signal processing of S-VHS but also the chroma signal processing of conventional VHS.

**(2) Block diagram**

Fig. 5-5 shows a block diagram of the Y/C signal processing circuit and Table 5-3 gives a functional description of individual pins of IC504.

**(3) Flow of Record/EE chroma signal**

The composite video signal fed from the VIDEO IN terminal or TUNER IN terminal is delivered to Q506 while the separate chroma signal fed from the S terminal is supplied to Q505. One of these chroma signals is selected by the two transistors.

Switching of the chroma signals is performed by controlling the DC voltage ("H" level for separate chroma input) applied to the base of Q505. The selected chroma signal is fed into FL501 (4.43 MHz band pass filter) to eliminate noise components outside the chroma signal bandwidth and to match the delay time with the Y signal. On the one hand, the chroma signal appears as an EE output at the CHROMA OUT terminal via EE/PB select switch consisting of Q523 and Q524.

On the other hand, the chroma signal is fed into pin ⑰ of IC504 (RH-IZ0157GEZZ) as a recorded colour signal and outputted from pin ⑳ of IC504 via the record/playback switch. The outputted chroma signal passes through the 4.43 MHz band pass filter (FL504) and the audio record switch in IC503. Inputted to pin ㉑ of IC504, the chroma signal is adjusted to a constant level by the internal ACC circuit. Then, in S-VHS mode, the pilot burst signal is added (not added in VHS mode) to the chroma signal, which is converted to a low frequency signal by the main converter in the next stage. After unwanted signal components are removed by the 1.2 MHz low pass filter, the chroma signal is outputted from pin ④ of IC504. Finally, the chroma signal is adjusted to a proper level and sent to the record amplifier circuit.

**(4) Flow of playback chroma signal**

The low band colour signal outputted from the video head passes through the low pass filter composed of L510, L511, etc. by which FM-Y components and unwanted off-band noise components are eliminated. The colour signal is then inputted to pin ㉒ and delivered to the main converter through the ACC amplifier, where the low band converted signal is converted to a 4.43 MHz chroma signal. This signal is outputted from pin ⑳ and fed into the 4.43 MHz band pass filter FL503 to remove unwanted off-band components. The output of FL503 is inputted to pin ㉑ through the record/playback switch in IC503. Then, the chroma signal goes through the internal amplifier and appears at pin ⑯. The chroma signal, of which crosstalk components are removed by comb filter DL502, is inputted to pin ⑭ of IC504.

Further, the pilot burst signal added at recording is removed in S-VHS mode, and the chroma signal is outputted from pin ① of IC504. This output

is sent to the video out select switch circuit through the record/playback switch Q523/Q524. The difference in chroma signal processing at playback between S-VHS and VHS lies in the signal used for APC detection. In S-VHS mode, APC detection is performed by using the pilot burst signal which was added when recording. This results in improvement of PM and colour flicker problem at the screen top. (The pilot burst signal allows stable APC operation since it is also added during vertical blanking periods and its phase is stable.) In VHS mode, the burst signal is used to perform APC detection as before.

### MESECAM DISCRIMINATION CIRCUIT

(For G and S versions of S1000 series only; X and H versions excluded)

The MESECAM discrimination circuit checks the incoming colour signal to discriminate between PAL and SECAM formats at recording. It checks the reproduced colour signal to discriminate between PAL and SECAM formats at playback. The principle of operation of the discrimination circuit is omitted here since it is completely same as the conventional system. The MESECAM discrimination circuit is composed of IC506 (RH-IZ0158GEZZ) and its associated circuits. Table 5-4 describes the functions of individual pins of IC506.

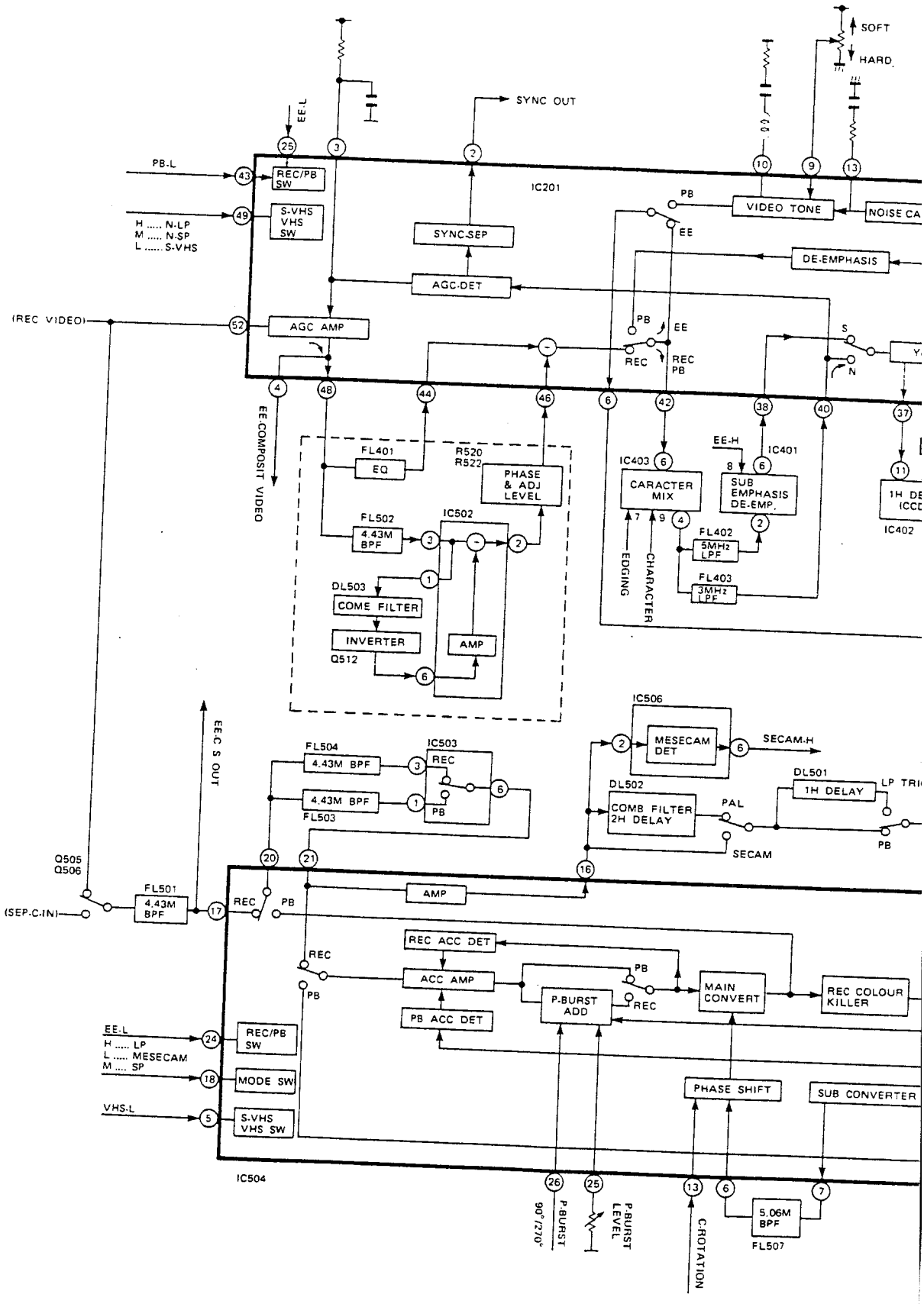
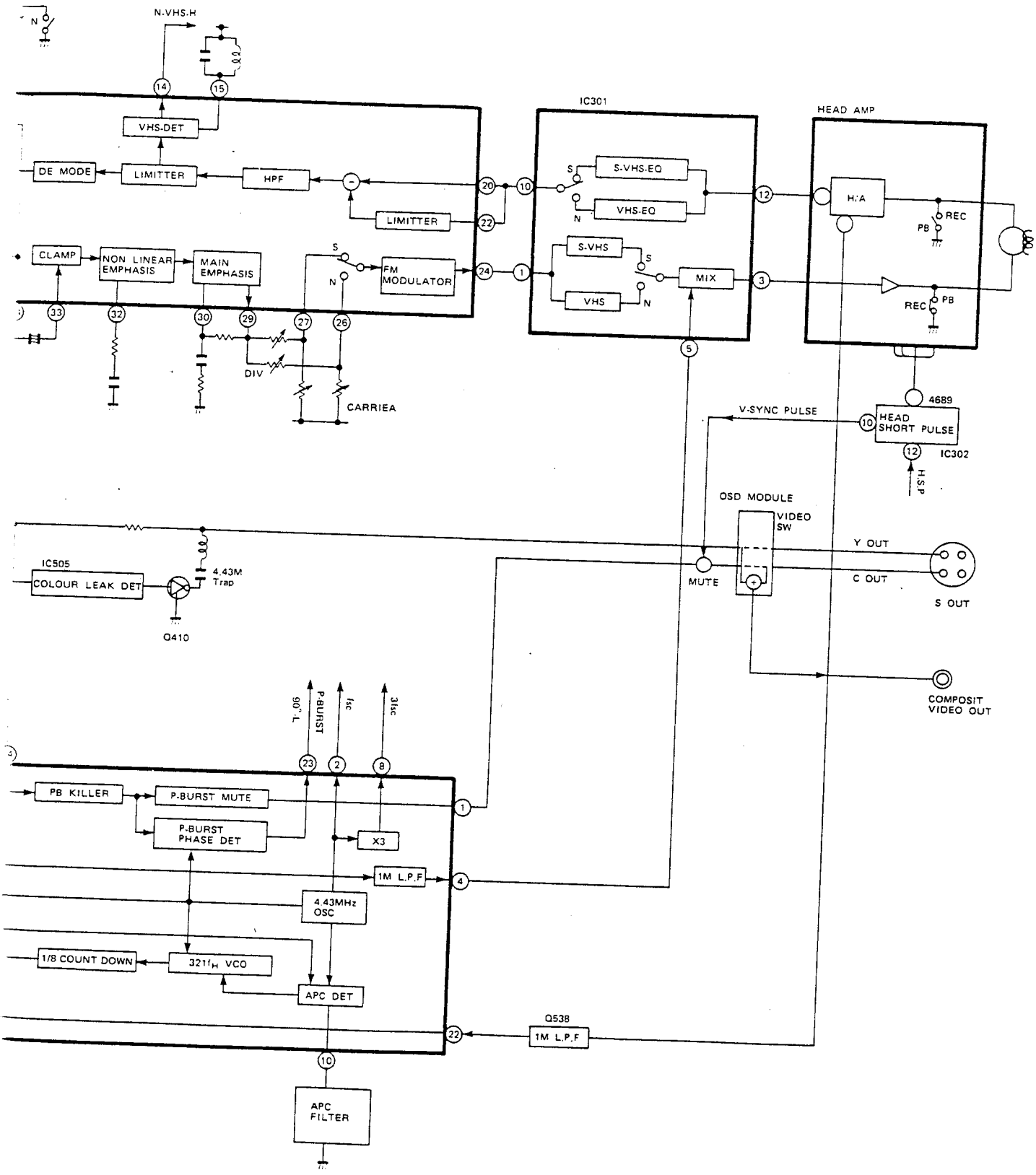
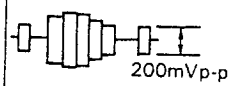
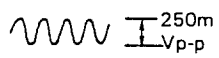
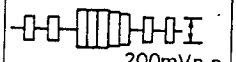
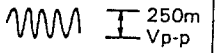
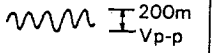
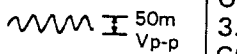
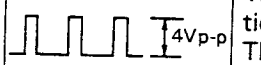
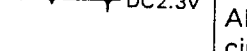
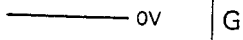
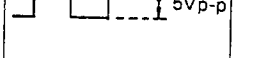
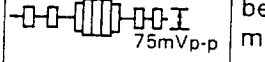

SOFT
HARD
SYNC OUT
EE-L
PB-L
REC/PB SW
S-VHS VHS SW
H ..... N-LP
M ..... N-SP
L ..... S-VHS
IC201
SYNC-SEP
AGC-DET
AGC AMP
(REC VIDEO)
PB
EE
REC
REC PB
VIDEO TONE
NOISE CA
DE-EMPHASIS
EE-COMPOSIT VIDEO
FL401
EQ
R520
R522
PHASE & ADJ LEVEL
IC502
FL502
4.43M BPF
DL503
COME FILTER
INVERTER
Q512
AMP
IC403
CARACTER MIX
EE-H
IC401
SUB EMPHASIS DE-EMP.
FL402
5MHz LPF
FL403
3MHz LPF
EDGING
CHARACTER
IC402
IC506
MESECAM DET
SECAM-H
DL501
1H DELAY
DL502
COMB FILTER 2H DELAY
PAL
SECAM
FL504
4.43M BPF
IC503
FL503
EE-C S OUT
Q505
Q506
(SEP-C-IN)
FL501
4.43M BPF
REC ACC DET
ACC AMP
PB ACC DET
P-BURST ADD
MAIN CONVERT
REC COLOUR KILLER
PHASE SHIFT
SUB CONVERTER
EE-L
H ..... LP
L ..... MESECAM
M ..... SP
VHS-L
REC/PB SW
MODE SW
S-VHS VHS SW
IC504
90°/270°
P-BURST
P-BURST LEVEL
C-ROTATION
5.06M BPF
FL507

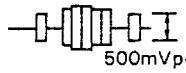
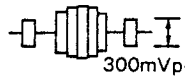
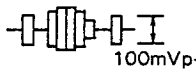
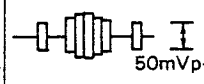
Figure 5



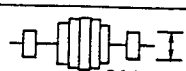
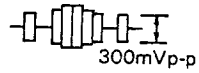
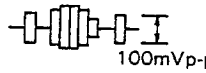
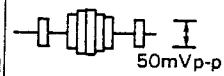

signal processing circuit

Table 5-3. Functions of pins of IC504 (RH-IZ0157GEZZ)

| Pin No. | Pin name | Typical waveform | Function |
|---|---|---|---|
| 1 | PB COLOUR OUT |   | Outputs the fully processed colour signal in pla The pilot burst signal is eliminated in S-VHS m is outputted in monochrome mode. |
| 2 | fsc OUT |   | Outputs a 4.433619 MHz signal generated by crystal oscillator. This output is used as a refer servo, HiFi signals, etc. |
| 3 | P-CON 5V | DC 5.2V | Vcc terminal for this IC. |
| 4 | REC LOW BAND CONVERTED COLOUR OUT |   | Outputs the colour signal down-converted by th verter when recording. The pilot burst signal is S-VHS mode. No signal is outputted in monoch |
| 5 | S-VHS/VHS SELECT TERMINAL | DC<br>VHS ... 0V<br>S-VHS ... 4.0V | Switches between S-VHS and VHS signal proc pin controls pilot burst on/off operation in recor playback mode, it controls switching of the col be sent to the APC circuit. |
| 6 | SUB CONV OUT |   | Outputs the signal of fsc ±40.125fh obtained converter. |
| 7 | 5.06 MHz SIGNAL IN |   | This pin receives the signal having a single freq nent of fsc ±40.125fh produced by passing th er output through the band pass filter. The chro down-converted by this signal in the main conv |
| 8 | 3fsc OUT |   | Outputs a signal (13.3 MHz) obtained by multip 3. This output is used as a reference clock for CCD. |
| 9 | SYNC IN |   | This pin receives the signal obtained by synchr tion of the record signal or playback signal in th This input is used as a reference signal to deter gate pulse timing, etc. |
| 10 | AFC/APC DETECT FILTER TERMINAL |   | Outputs the AFC detected signal in record mod tected signal in playback mode. Gain and respo AFC and APC circuits are determined by the ex circuit. |
| 11 | GND |   | Grounding terminal for this IC |
| 12 | COLOUR KILLER DISCRIMINATION OUT | DC<br>Colour ... 4.0V<br>B/W ... 0V | Outputs the judgment result of the internal colo circuit. |
| 13 | COLOUR ROTATION SIGNAL IN |   | This signal controls the colour rotation phase. |
| 14 | PLAYBACK COLOUR KILLER AMP IN |   | The colour signal from which crosstalk compon been eliminated by the comb filter is inputted in mode. The pilot burst signal is not eliminated in mode. |
| 15 | COLOUR KILLER DETECT TERMINAL | DC<br>Colour ... 1.2V<br>B/W ... 2.4V | This is an output terminal for the colour killer d nal. This pin is also used to forcibly select colo applying "L" level from outside. |

| Pin No. | Pin name | Typical waveform | Function |
|---|---|---|---|
| 16 | REC ACC OUT/PB COMB DRIVE OUT |  500mVp-p | This pin outputs the colour signal through ACC in record mode; the colour signal for eliminating crosstalk in playback mode. (The output contains pilot burst signal in S-VHS mode.) |
| 17 | RECORDED COLOUR SIGNAL IN |  300mVp-p | The colour signal inputted at recording is inputted to this pin. |
| 18 | SP/LP/MESECAM MODE SELECT TERMINAL | DC<br>PAL SP ... 3.0V<br>PAL LP ... 4.5V<br>MESECAM ... 0V | This pin select signal processing in SP mode, LP mode, MESECAM mode, etc. In record mode, it is used to select the rotation control; in playback mode, to select the APC loop. |
| 19 | PB ACC RESPONSE SELECT TERMINAL | Other than Trick mode ... 4V<br>Tick mode ... 0V<br>DC | This pin controls ACC response. In trick motion mode, ACC response is quickened to reduce flicker of the picture. |
| 20 | REC/PB SW OUTPUT TERMINAL | 300mVp-p | This pin outputs the colour signal inputted to pin ⑰ in recor mode. In playback mode, it outputs the main converter output signal (containing the pilot burst signal in S-VHS playback mode). |
| 21 | REC ACC IN/ PLAYBACK AMP IN |  100mVp-p | The signal outputted from pin ⑳ is passed through a 4.43 MHz band pass filter to eliminate unwanted frequency components. The resultant colour signal is inputted to this pin. |
| 22 | PLAYBACK DOWN-CONVERTED COLOUR SIGNAL IN |  50mVp-p | In playback mode, the playback down-converted colour sign is inputted after unwanted frequency components have beer removed by the low pass filter. |
| 23 | PLAYBACK PILOT BURST PHASE DISCRIMINATION OUT | DC<br>90° ... 0V<br>270° ... 4.5V | This pin outputs the result of phase discrimination of the pilot burst signal contained in the reproduced colour signal. |
| 24 | RECORD/ PLAYBACK SWITCHING CONTROL PIN | DC<br>EE ... 0.5V<br>PB ... 4.0V | This pin provides a control signal which selects record or playback operation of this IC. |
| 25 | PILOT BURST LEVEL ADJUSTMENT PIN | DC .....1.0V | This pin adjusts the level of the pilot burst signal which is added to the recorded colour signal. The pilot burst signal level is adjusted by varying the DC voltage applied to pin ㉕ |
| 26 | RECORDING PILOT BURST PHASE SWITCHING CONTROL PIN | DC<br>90° ... 1.0V<br>270° ... 4.0V | This pin switches the phase of the pilot burst signal which added to the recorded colour signal. |

**Note:** Waveforms, signal levels, and DC voltages shown in the Typical waveform column in the above tab are just typical. They may vary slightly from unit to unit.

| Pin No. | Pin name | Typical waveform | Function |
|---|---|---|---|
| 16 | REC ACC OUT/PB COMB DRIVE OUT | 500mVp-p | This pin outputs the colour signal through ACC in recor mode; the colour signal for eliminating crosstalk in playl mode. (The output contains pilot burst signal in S-VHS mode.) |
| 17 | RECORDED COLOUR SIGNAL IN |  300mVp-p | The colour signal inputted at recording is inputted to thi |
| 18 | SP/LP/MESECAM MODE SELECT TERMINAL | DC<br>PAL SP ... 3.0V<br>PAL LP ... 4.5V<br>MESECAM ... 0V | This pin select signal processing in SP mode, LP mode, MESECAM mode, etc. In record mode, it is used to sele the rotation control; in playback mode, to select the AP loop. |
| 19 | PB ACC RESPONSE SELECT TERMINAL | Other than Trick mode ... 4V<br>Tick mode ... 0V<br>DC | This pin controls ACC response. In trick motion mode, A response is quickened to reduce flicker of the picture. |
| 20 | REC/PB SW OUTPUT TERMINAL |  300mVp-p | This pin outputs the colour signal inputted to pin ⑰ in r mode. In playback mode, it outputs the main converter put signal (containing the pilot burst signal in S-VHS pla back mode). |
| 21 | REC ACC IN/ PLAYBACK AMP IN |  100mVp-p | The signal outputted from pin ⑳ is passed through a 4. MHz band pass filter to eliminate unwanted frequency c ponents. The resultant colour signal is inputted to this p |
| 22 | PLAYBACK DOWN-CONVERTED COLOUR SIGNAL IN |  50mVp-p | In playback mode, the playback down-converted colour is inputted after unwanted frequency components have removed by the low pass filter. |
| 23 | PLAYBACK PILOT BURST PHASE DISCRIMINATION OUT | DC<br>90° ... 0V<br>270° ... 4.5V | This pin outputs the result of phase discrimination of the lot burst signal contained in the reproduced colour signa |
| 24 | RECORD/ PLAYBACK SWITCHING CONTROL PIN | DC<br>EE ... 0.5V<br>PB ... 4.0V | This pin provides a control signal which selects record o playback operation of this IC. |
| 25 | PILOT BURST LEVEL ADJUSTMENT PIN | DC .....1.0V | This pin adjusts the level of the pilot burst signal which added to the recorded colour signal. The pilot burst sign level is adjusted by varying the DC voltage applied to pir |
| 26 | RECORDING PILOT BURST PHASE SWITCHING CONTROL PIN | DC<br>90° ... 1.0V<br>270° ... 4.0V | This pin switches the phase of the pilot burst signal whi added to the recorded colour signal. |

**Note:** Waveforms, signal levels, and DC voltages shown in the Typical waveform column in the above are just typical. They may vary slightly from unit to unit.

Table 5-4. Functions of pins of IC506 (RH-IZ0158GEZZ)

| Pin No. | Pin name | Typical waveform | Function |
|---|---|---|---|
| 1 | P-CON 9V | DC 9.0 V | Vcc terminal of this IC |
| 2 | COLOUR SIGNAL IN | 500mVp-p | This is the input terminal for the colour signal used for mod discrimination. PAL colour signal is inputted in PAL mode; SECAM colour signal is inputted in SECAM mode. |
| 3 | GATE PULSE IN | | This is the gate pulse input for sampling the burst signal an ID signal. |
| 4 | FORCED SECAM MODE IN | DC 0 V | This is the input terminal for the signal used for selecting forced SECAM mode. When "H" level is applied to this pin, pin ⑥ outputs "SECAM mode". This pin is not used in this model. |
| 5 | 1/2 fh AMP GAIN | | This terminal allows setting of the mode discrimination gain. |
| 6 | DISCRIMINATION OUTPUT PIN | DC<br>MESECAM ... 8V<br>PAL B/W ... 0V | This pin outputs the result of mode discrimination. |
| 7 | GND |  0V | Ground terminal of this IC. |

# S-VHS MODE SELECTION SYSTEM

## 1. General

In principle, selection of S-VHS mode or VHS mode is made by the S-VHS ON/OFF switch on the front panel in EE (REC) mode. In playback mode, it is done by detecting the difference in the video signal modulating frequency of the replayed signal between S-VHS and VHS.

## 2. Mode select conditions

(1) In EE (REC) mode

S-VHS mode is selected when the S-VHS ON/OFF switch is ON; VHS mode is selected when it is OFF. In the following cases, however, the VCR selects VHS mode forcibly:

(i) A VHS tape is inserted. (N-TAPE(H) = "H")

(ii) SECAM signal is selected as the record signal. (SECAM(H) = "H")

(2) In playback mode

Mode is selected by detecting the difference in the video signal modulating frequency of the replayed signal between S-VHS and VHS. (AUTO PB-N(H) = "H" in VHS mode)

In the following cases, however, the VCR selects VHS mode forcibly:

(i) A VHS tape is inserted. (N-TAPE(H) = "H")

(ii) Replayed signal is SECAM signal. (SECAM(H) = "H")

## 3. Mode select circuit

S-VHS mode select circuit diagram and its block diagram is shown in Figs. 6-1 and 6-2.

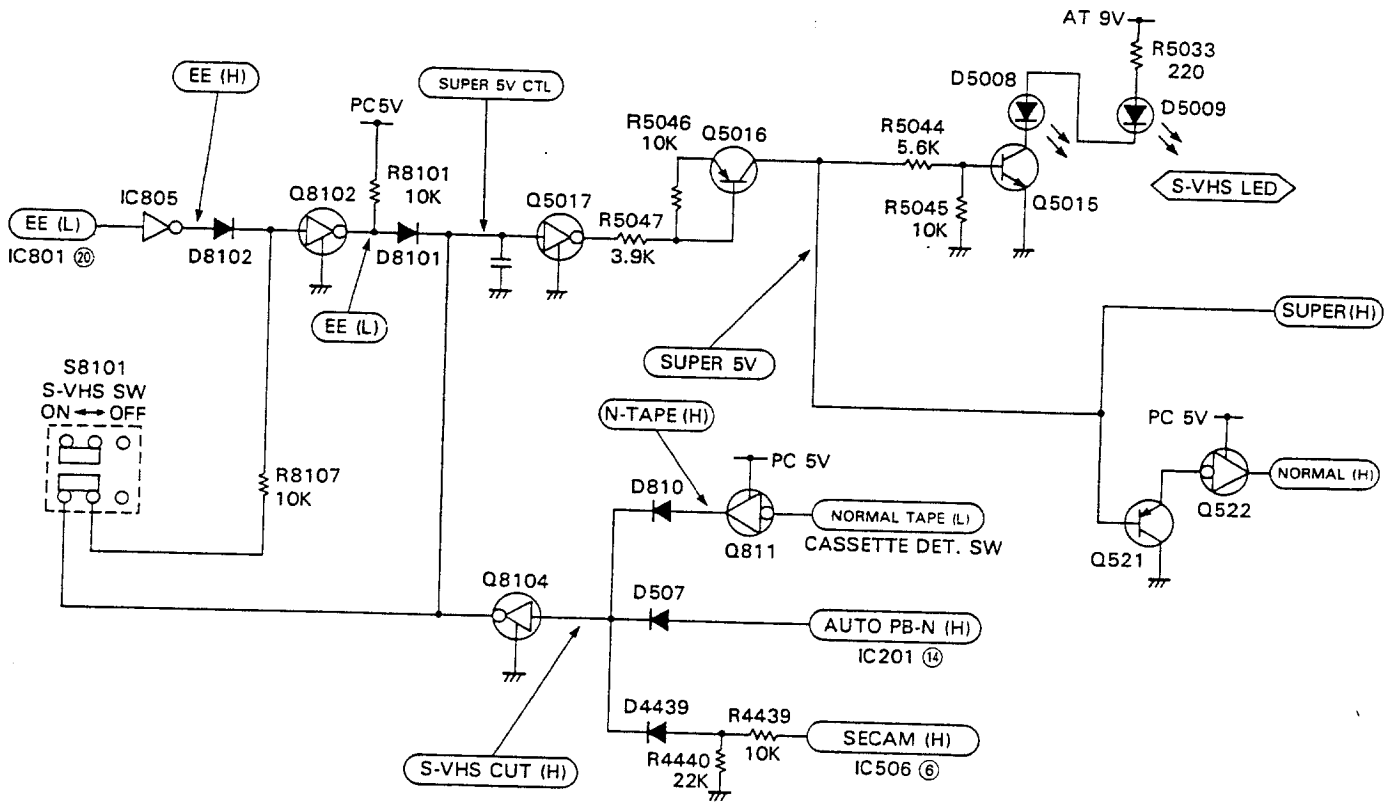
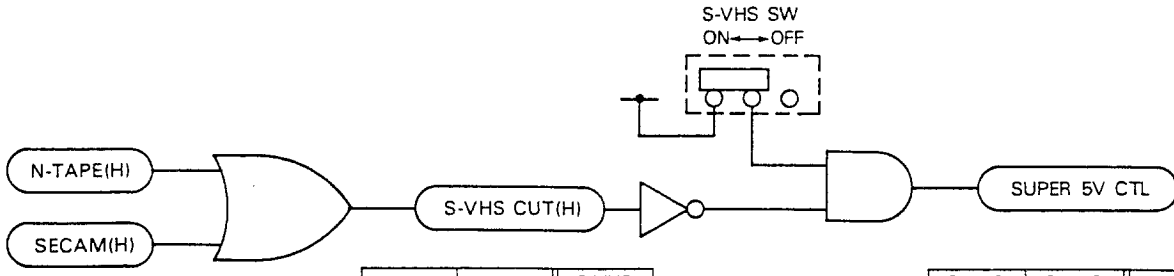



Figure 6-1. S-VHS mode select circuit diagram

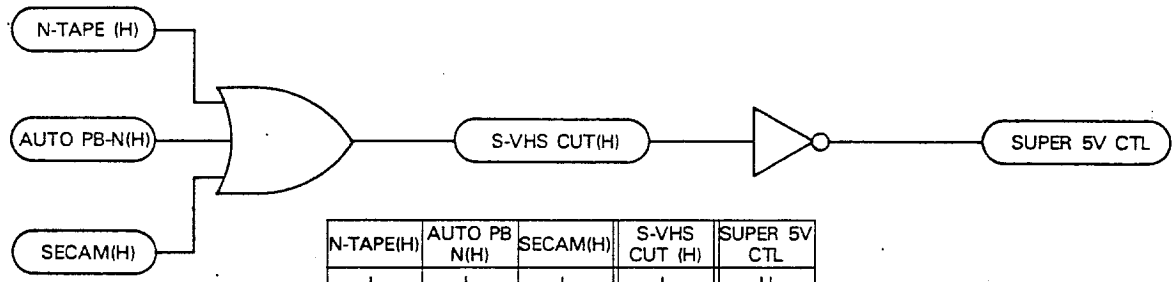
## IN EE (REC) mode




| N-TAPE(H) | SECAM(H) | S-VHS CUT (H) |
|---|---|---|
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | H |

| S-VHS CUT (H) | S-VHS SW | SUPER 5V CTL |
|---|---|---|
| L | L | L |
| L | H | H |
| H | L | L |
| H | H | L |

## IN Playback mode




| N-TAPE(H) | AUTO PB N(H) | SECAM(H) | S-VHS CUT (H) | SUPER 5V CTL |
|---|---|---|---|---|
| L | L | L | L | H |
| L | L | H | H | L |
| L | H | L | H | L |
| L | H | H | H | L |
| H | L | L | H | L |
| H | L | H | H | L |
| H | H | L | H | L |
| H | H | H | H | L |

**Figure 6-2. S-VHS mode select circuit block diaram**

# SWITCHING REGULATOR POWER SUPPLY AND AUTOMATIC VOLTAGE SYNTHESIZER FUNCTIONS

## SWITCHING REGULATOR POWER SUPPLY

This power supply unit is a flyback type switching regulator having a circuit configuration as shown in Fig. 7-1.

Its basic operation is as follows. The AC power input is rectified and smoothed to create a DC source voltage. This DC voltage turns on and off the transistor incorporated in IC901. While the transistor is on, energy is charged into T901. When the transistor turns off, the energy is transferred to the secondary side of T901, of which output is rectified and smoothed to obtain a DC output.

Explanation of each block of the circuit shown in Fig. 7-1 is given below:

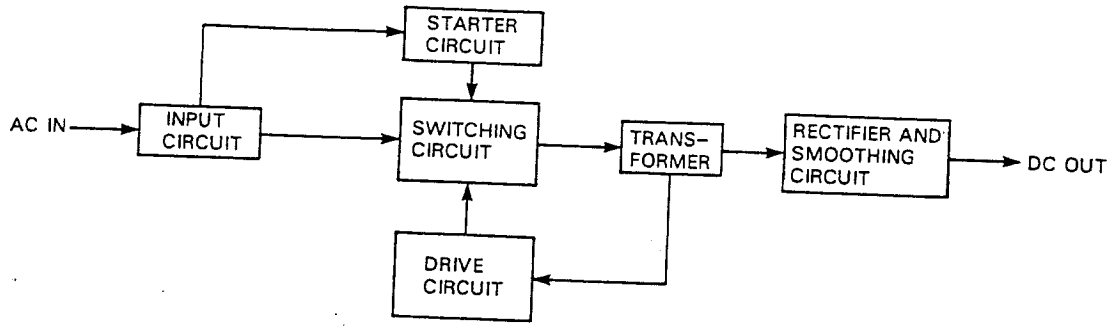



Figure 7-1. Block Diagram

### 1. Input circuit

The input circuit is composed of a noise filter circuit, rectifier and smoothing circuit. The filter circuit, L901 being its major element, suppresses various noise components contained in its input and output. The AC input is rectified by D901 and smoothed by C908 to obtain a DC voltage.

### 2. Switching circuit

The DC voltage outputted from the input circuit causes the transistor built in IC901 to produce a switching waveform. IC901 is a switching IC incorporating a power transistor which combines the constant voltage output function and overcurrent protection function. Individual pins of IC901 are connected as follows:

Pin ① ..... Voltage detect terminal
Pin ② ..... Base of power transistor
Pin ③ ..... Collector of power transistor
Pin ④ ..... Emitter of power transistor
Pin ⑤ ..... Overcurrent detection terminal

To control the output voltage of the switching circuit, the output voltage is fed back from the voltage detect winding to pin ① of IC901 through D904 and D905. Pin ⑤ detects an overcurrent condition. If the voltage between pins ④ and ⑤ increases due to overcurrent, the collector current of the power transistor in IC901 is reduced. The snubber circuit consisting of D903, C909 and R910-R913 is provided to protect IC901 by absorbing the counter-electromotive force which is generated when the power transistor is turned off.

### 3. Transformer

The transformer is composed of the primary winding connected to terminals K, L and M, detect winding Pr connecting between P and Q, and 5 secondary windings.

The primary winding is divided into two sections, i.e. section P1 (between L and M) and section P2 (between K and L) sandwiching the other windings to optimize magnetic coupling with them.

### 4. Drive circuit

The drive circuit applies an appropriate signal to the base of the power transistor incorporated in IC901. It is intended to ensure smooth switching operation of the power transistor.

When IC901 is in OFF state, the voltage at terminal Q of Pr winding of T901 is higher than that at terminal P. At this time, a current flows from terminal Q to terminal P through D906, C914 and D907 in this order to charge C914. IC901 is turned on in the following sequence. Energy charged up in C914 flows through R916 → IC901 → Q901 (turned on) → C914 in order. Thus, energy is supplied to IC901 to drive the power transistor.

R917 and C915 are provided to turn on Q901 when the polarity of the Pr winding output is inverted.

### 5. Starter circuit

Immediately after power-on, C914 is not charged with energy for driving IC901. It is therefore necessary to feed an external signal to the base of the power transistor in IC901. The starter circuit consisting of R905 thru R909 is provided for this purpose. The starter circuit is deactivated when IC901 has started oscillation (switching).

### 6. Circuits on secondary side of transformer

Output voltages in rectangular waveforms appear across the secondary windings of T901 depending on the oscillating status of IC901. These voltages are rectified by diodes and smoothed out by capacitors and choke coils to obtain DC output voltages. Outputs requiring high voltage accuracies are further provided with constant voltage regulator IC's.

A circuit diagram of the switching regulator power supply unit is given on Fig. 7-2.

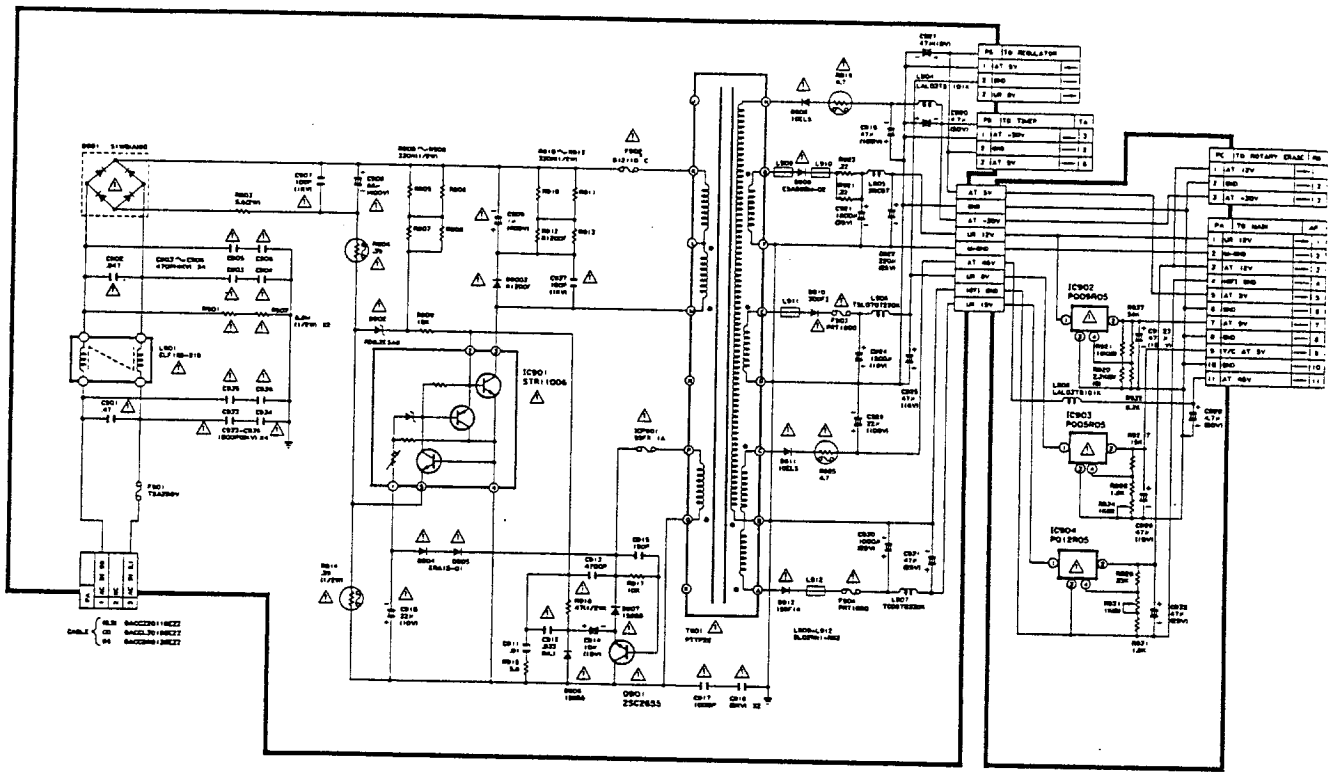


Figure 7-2.

## AUTOMATIC VOLTAGE SYNTHESIZER

The automatic voltage synthesizer detects the existence of broadcast signals while tuning the receiver. When the existence of a broadcast signal has been detected, tuning is automatically stopped and the frequency of the signal is stored in the memory. An operational description of this system is given in the following:

### 1. Signal detection (See Fig. 7-3.)

Existence or non-existence of a signal is detected by feeding the AFT voltage (pin ④ of IF pack) outputted from the P-IF detect IC and the sync detect output (pin ⑩ of IC1401) of the demodulated video signal into an AND gate. (The AFT voltage and sync detect output are fed to the AND gate taking account of a signal containing only the carrier and lacking the sync signal.)

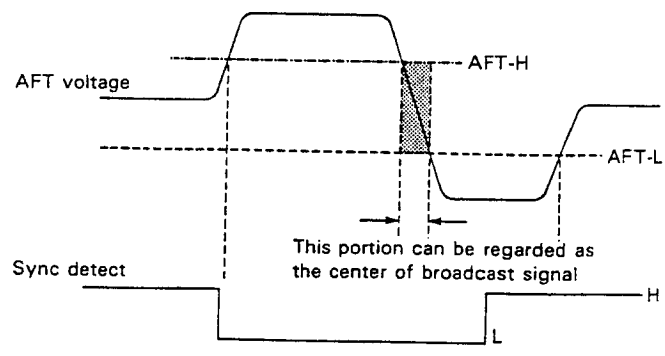



Figure 7-3. AFT voltage and sync detect output

## 2. Operation (See Fig. 7-4.)

a) Tuning voltage VT is increased at the maximum speed until the status SYNC DETECT = "L" and AFT VOLTAGE>AFT-H is detected.

b) When the status SYNC DETECT = "L" and AFT VOLTAGE>AFT-H has been detected, the increase rate of VT is reduced. VT is further increased, however, until the status AFT VOLTAGEßAFT-L is detected.

c) VT is reduced in the smallest steps to detect the status AFT VOLTAGE = AFT-L. Tuning voltage VT when this status is detected is put as "A".

d) VT is further reduced in the smallest steps to detect the status AFT VOLTAGE = AFT-H. Tuning voltage VT when this status is detected is put as "B".

e) The VT value just at the middle of "A" and "B" is calculated, and this voltage is outputted. (Required level) = (B - A)/2

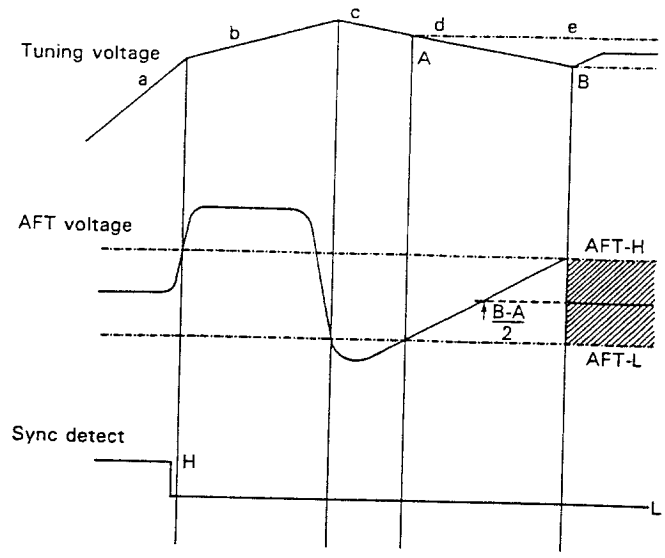



Figure 7-4. Change of individual voltages during tuning

At the end of the above process, the VT data and band data are stored in E²PROM, completing the tuning procedure.

A block diagram of the automatic voltage synthesizer circuit is shown in Fig. 7-5.

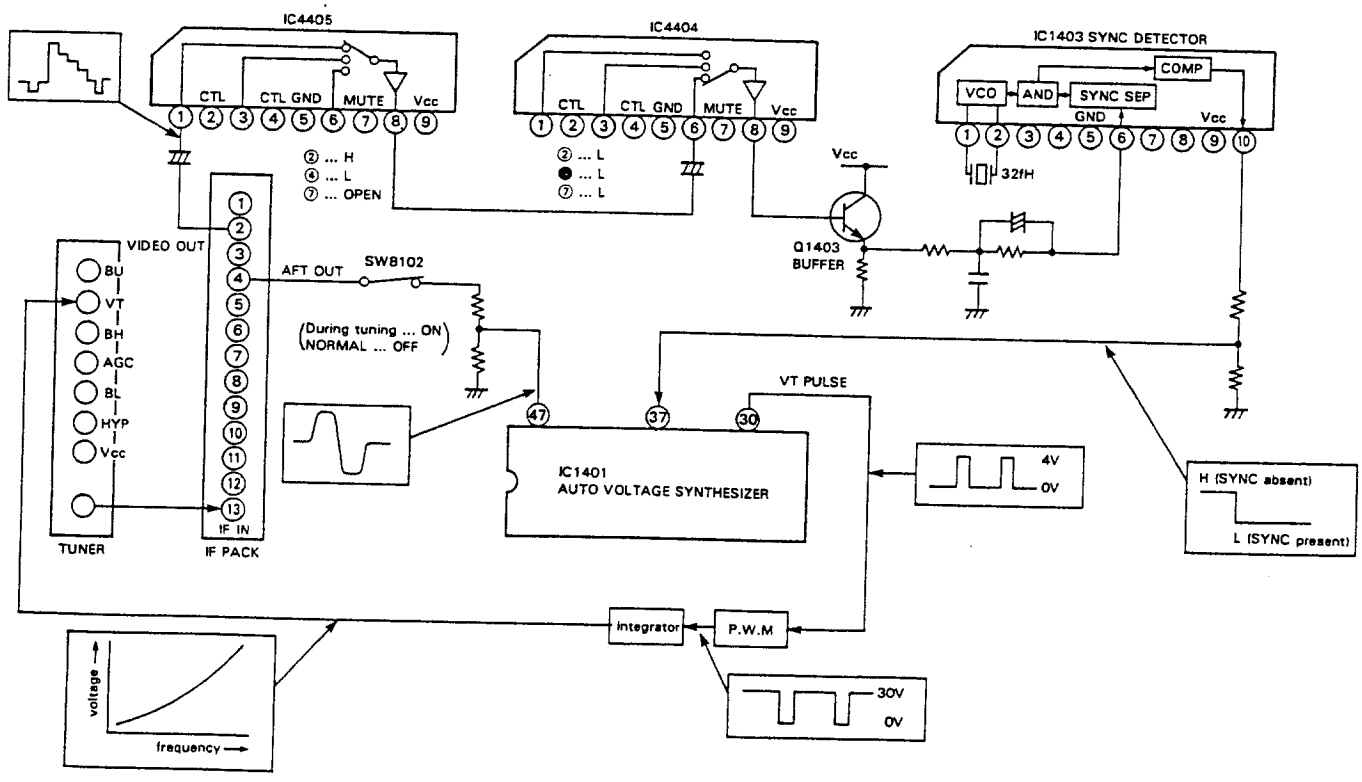



Figure 7-5. Auto Voltage Synthesizer Block Diagram

# HiFi CIRCUIT AND Y/C SEPARATING CIRCUIT

**HiFi circuit**

Fig. 8-1 shows a block diagram of the HiFi circuit in which flow of the HiFi signal is described.

**1. Input signal switching circuit**

- The microphone input is fed into pin ① (pin ㊷) of HiFi input switching IC IC6302 through the microphone amplifier incorporated in IC6602. All the part numbers and pin numbers cited below are for the L channel (R channel).
  When an audio signal is inputted from the MIC IN terminal, the microphone jack switch causes the LINE IN (1) and LINE IN (2) signals to be muted by Q6608 thru Q6611, allowing only the MIC IN signal to be outputted.
- The LINE IN (1) or LINE IN (2) signal, selected by the control signal ("H" level) entered from the front panel, is inputted to pin ① (pin ㊷) of IC6302.
- The tuner input is fed from pin ⑯ (pin ⑱) of the IF sound multiplex unit to pin ③ (pin ㊵) of IC6302.
- The LINE IN (MIC IN) signal and TUNER IN signal are switched by the INPUT SW CTL signal at pin ㉞ of IC6302.

**2. EE system circuit**

The signal selected by the input signal switching circuit in IC6302 is outputted from pin ② (pin ㊶) and adjusted to a desired level by the electronic potentiometer in IC6601. The resultant signal is inputted to pin ① (pin ㊷) of IC6303, where it is amplified 5 dB and outputted from pin ④ (pin ㊴).
This signal is inputted to pin ⑰ (pin ㉖) of IC6302 and selected by output switches (1) and (2) as an output signal. These output switches are switched by the logic of the control signals fed to pins ㉙ and ㉚. (The logic table is shown in Figure 7-6.) The output of the output switches is amplified 12 dB and outputted from pin ⑲ (pin ㉔) of IC6302 as a LINE OUT signal.

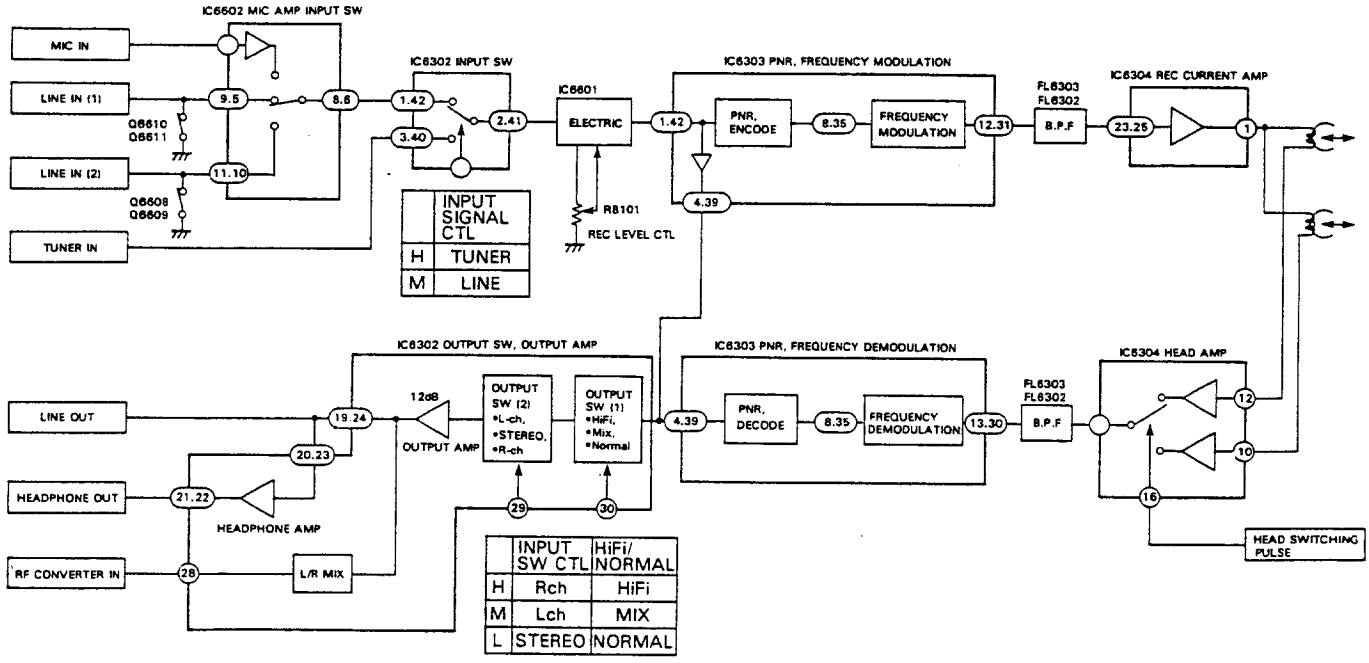



**Figure 8-1. HiFi Circuit Block Diagram**

The LINE OUT signal for the headphone enters the headphone amplifier from pin ⑳ (pin ㉓) of IC6302 and outputted from pin ㉑ (pin ㉒) of IC6302. The headphone signal level is adjusted by an electronic potentiometer built in IC 6302. Pin ㉕ of IC6302 works as a control terminal for the electronic potentiometer, and the control voltage supplied to this pin is adjusted by the headphone level control on the front panel. The lower the control voltage, the higher the output level. The RF converter input is provided from pin ㉘ of IC6302 after mixing the R channel and L channel signals in the IC.

### 3. Recording circuit

Like the EE signal, the audio signal to be recorded is inputted to pin ① (pin ㊷) of IC6303. This signal is encoded (compressed) by the P.N.R. circuit and outputted from pin ⑧ (pin ㉟) of IC6303. The compression ratio of the P.N.R. circuit expressed in decibels is x2. For example, an input of −20 dBs to pin ① is amplified 5 dB to provide an input level of −15 dBs to the P.N.R. circuit. The P.N.R. increases this level to −7.5 dBs, twice as higher the input level in decibels. If the input is −30 dBs, the input to the P.N.R. is −30 dBs + 5 dB = −25 dBs and the output is −12.5 dBs. As such, the output level of the P.N.R. is always twice as the input level in decibel values.

The output of the P.N.R. is then frequency-modulated in IC6303 and outputted from pin ⑫ (pin ㉛). This output is passed through band pass filter FL6303 (FL6302) and inputted to pin ㉓ (pin ㉕) of record current amplifier IC6304. The signals from both the L channel (1.3 MHz) and R channel (1.7 MHz) are mixed in IC6304 and outputted from pin ① so that a current flows in the HiFi heads to finally record the audio signal.

### 4. Playback circuit

The playback signals picked up by the HiFi heads are inputted to pin ⑫ (pin ⑩) of the head amplifier in IC6304. The amplified CH-1 and CH-2 playback signals are switched by the head switching pulse and outputted from pin ㉑ of IC6304 in the form of a continuous wave playback FM signal.

This signal is then separated into the L channel (1.3 MHz) and R channel (1.7 MHz) signals by band pass filter FL6303 (FL6302). The L channel and R channel signals are inputted to pins ⑬ and ㉚ of IC6303 respectively.

The input signal is frequency-demodulated in IC6303 and outputted from its pin ⑧ (pin ㉟) as an audio signal.

The playback circuit has some additional functions as described in the following. The first is the hold function to compensate for signal dropouts. The playback signal is held by the hold capacitor externally connected to pin ⑰ (pin ㉖).

Another function of the playback circuit is automatic discrimination of HiFi and normal signals. In HiFi mode, the automatic discrimination output at pin ㉕ becomes "H" level, while "L" level is outputted in normal mode.

The playback signal is inputted to the P.N.R. circuit and decoded (expanded) contrary to the recording process. To describe the relation between the input and output levels of the P.N.R., if an input level is −7.5 dBs, for example, the output is −15 dBs.

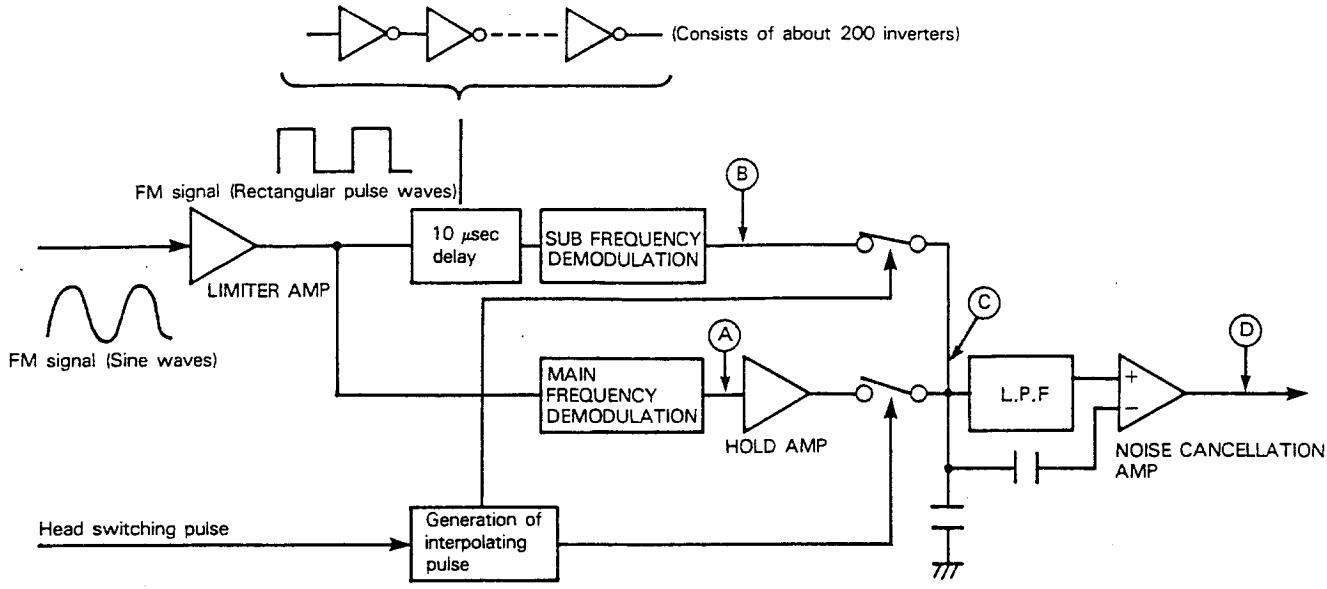
The output of the P.N.R. is inputted from pin ④ (pin ㊴) of IC6303 to the output switch IC IC6302 and goes through the same signal processing as in the EE circuit before the playback signal is finally outputted from IC6302.

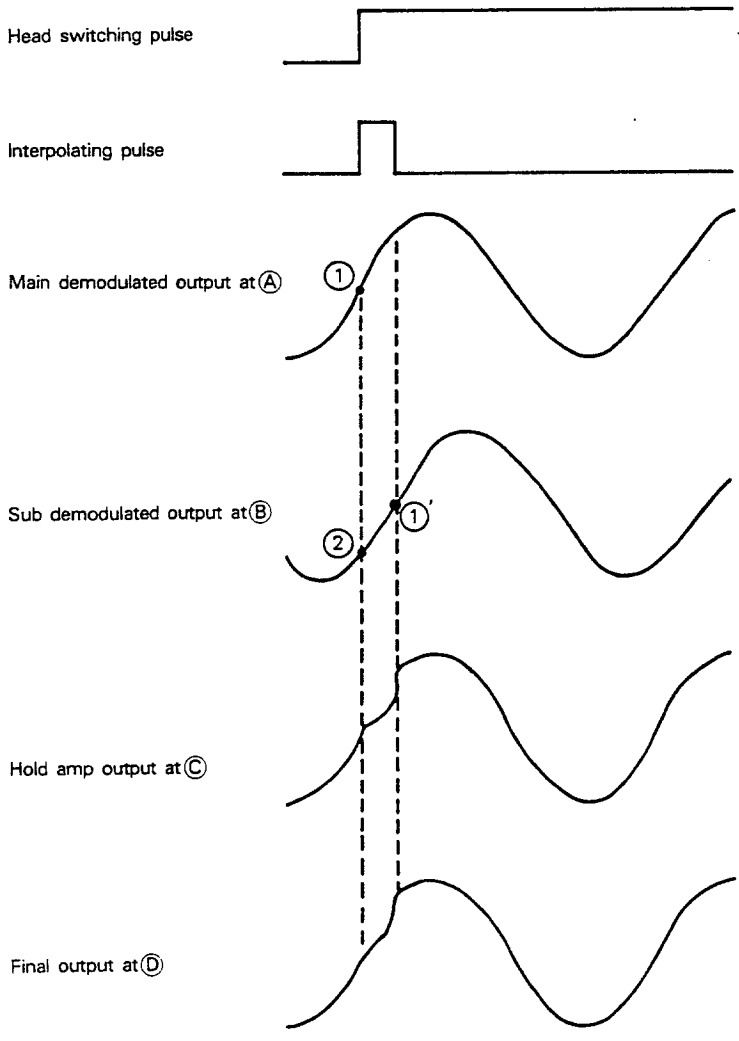
**Description :** 3D circuit (Digital Delayed Differential circuit)

**Features :**

(1) The FM signal is converted into a pulse signal. This signal is delayed in the IC by the digital processing technique to reduce the variation in noise level compared to the conventional circuit.

(2) In addition to (1) above, a new noise cancellation circuit has been employed to improve the SNR.




8-2. Block Diagram

## Y/C SEPARATING CIRCUIT

S-VHS employs a comb filter system since it requires a recording luminance signal bandwidth of over 5 MHz to obtain high quality picture with more than 400 horizontal scanning lines.

The PAL colour signal is rather similar to the signal in the 2H delay line and its phase is completely inversed. Taking advantage of this characteristic, the colour signal and luminance signal are separated by addition and subtraction between the PAL colour signal and the 2H delay signal.

This process is explained in Figs. 8-3 and 8-4.

Fig. 8-3 is a block diagram of the Y/C separation circuit. In Fig. 8-4, indicates the phase of the luminance signal while indicates the phase of the colour signal. Waveform Ⓐ shows the composite video signal (Y + C). It is delayed by 2H delay circuit ① to obtain waveform Ⓑ and the phase is inversed as in waveform Ⓒ . Waveforms Ⓐ and Ⓒ are mixed together. The luminance signal is cancelled since it well resembles the signal in the 2H delay circuit. The colour signal is doubled as in waveform Ⓓ since waveforms Ⓐ and Ⓒ contain the colour signals with the same phase. The signal shown in Ⓓ of which amplitude is divided by 2 is subtracted from (inverted and mixed with) the signal shown in Ⓐ . The colour signal is cancelled and only the Y signal is outputted at Ⓔ .

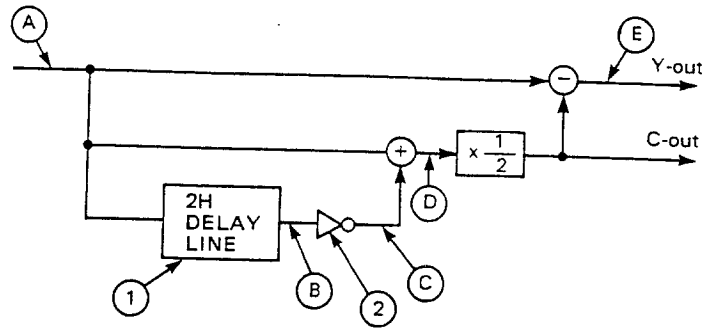



Figure 8-3. Y/C separation circuit block diagram

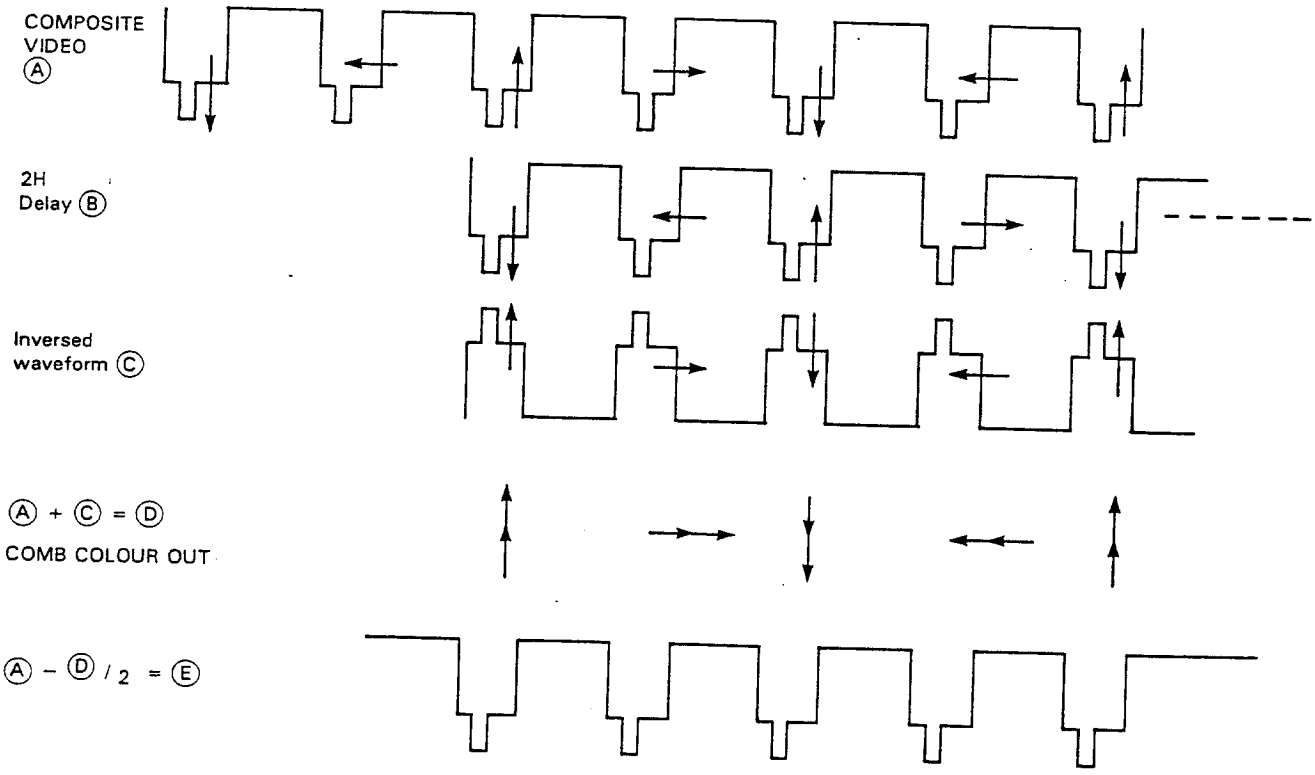



Figure 8-4.

Fig. 8-5 is the Y/C separation circuit of this VCR. FL502 is provided for limiting the Y/C separation bandwidth. FL401 is a 300 nsec equalizer which adjusts the timing to match the delay time caused by FL502. R533 is used to adjust the signal mixing ratio for minimum luminance signal components. R520 and R522 are for fine adjustment of waveform C so that the signal with completely inversed phase and same amplitude with the colour signal contained in the composite signal is mixed.

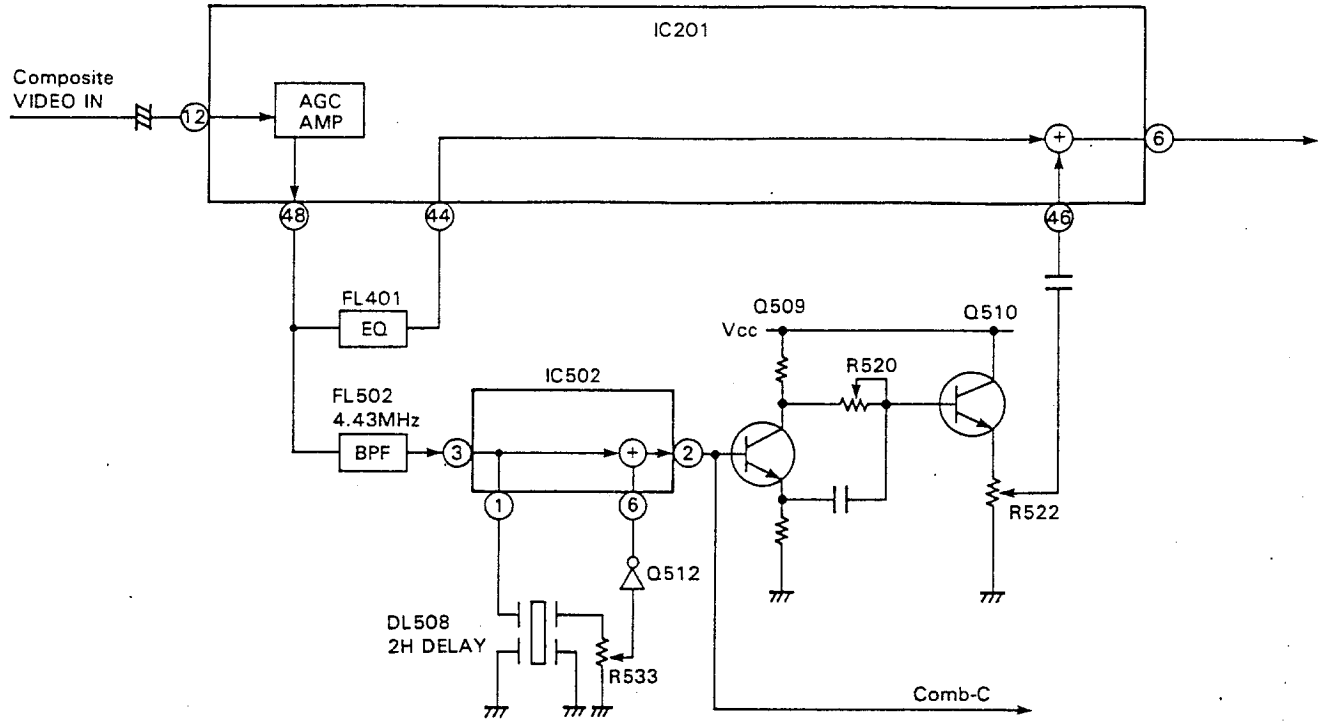



Figure 8-5.

**Non-correlation Detection Circuit**

It is a prerequisite for Y/C separation that the signal well resembles the 2H earlier signal. But if it is not true, the colour signal will not be cancelled by the colour signal contained in the composite signal by addition and subtraction, causing the colour signal to leak into the Y signal. The non-correlation detection circuit checks if there is no similarity with the 2H earlier signal, and remove the leakage of the colour signal into the Y signal whenever it occurs.

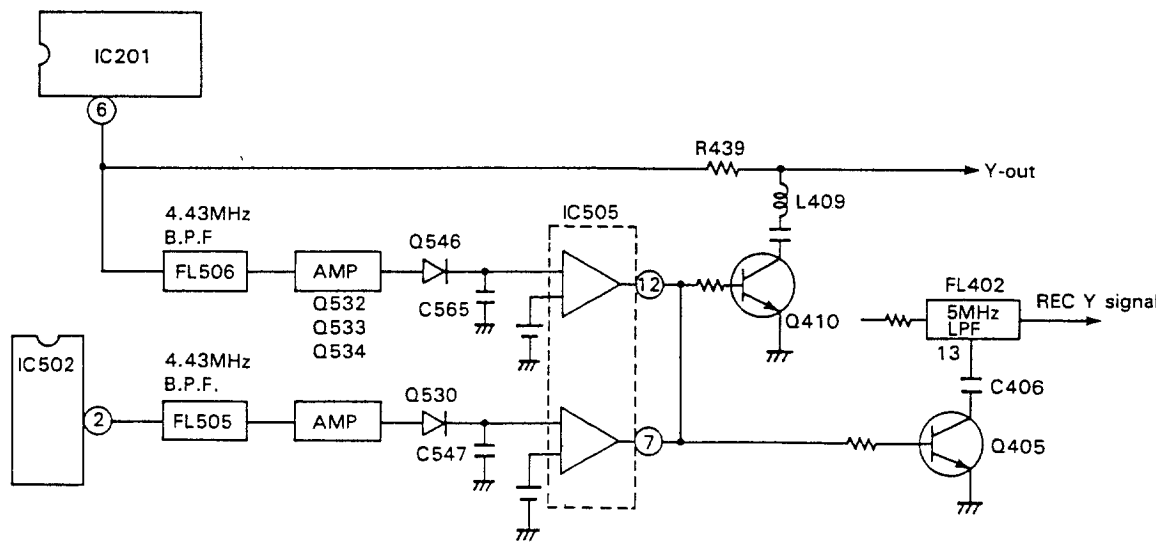



Figure 8-6.

Pin ⑥ of IC201 is the output terminal of the Y signal. If there is no correlation with the 2H earlier signal, the colour signal will leak into the Y signal. The leaked colour signal is taken out by the 4.43 MHz band pass filter FL505 and amplified. Q546 and C565 forms a peak detection circuit. It outputs High level when the 4.43 MHz component is present to cause comparator output pin ⑫ of IC505 to output a noncorrelation pulse. Q410 is turned on by this control signal activating the 4.43 MHz trap composed of L409 and C429 to remove the colour signal. Q405 switches C406 to form a 4.43 MHz trap by FL402, which removes the leaked colour signal out of the recorded luminance signal.

Pin② of IC502 outputs the colour signal with the luminance signal already cancelled. The colour signal is detected by Q530 and C547. When the luminance signal of 4.43 MHz band is inputted, pin ⑦ of IC505 becomes Low level. In this case, non-correlation pulse is not outputted and, therefore, the picture is not blurred out by the trap.

**YNR Circuit (Y Noise Reduction) and LNC (Line Noise Canceller) Circuit**

The video signal repeats the more or less similar pattern from one horizontal scan line to the next. The LNC circuit makes use of this correlation between succeeding scan lines to detect noise which occurs randomly. The detected noise is inversed and reduced by mixing the original and inversed noise signals. The YNR circuit is a looped feedback circuit which feeds back the 1H delayed signal to the earlier stage.1. Playback luminance signal Y2. Playback luminance signal The YNR circuit block diagram is shown in Fig. 8-7. The luminance signal inputted to pin ㊵ is delayed by 1H and adjusted to an appropriate level by R416. This signal is inversed by the inversing amplifier and mixed with the original luminance signal. By this process the luminance signal is cancelled leaving only the noise components at point Ⓒ . The noise is passed through the limiter and inversed. The inversed noise signal is added to the original video signal to reduce the noise. Pin ㊺ is the control terminal for switching between the YNR and LNC circuits. When the switch is opened, the YNR mode feedback loop is activated. The picture is a little blurred in the vertical direction but noise is reduced dramatically.

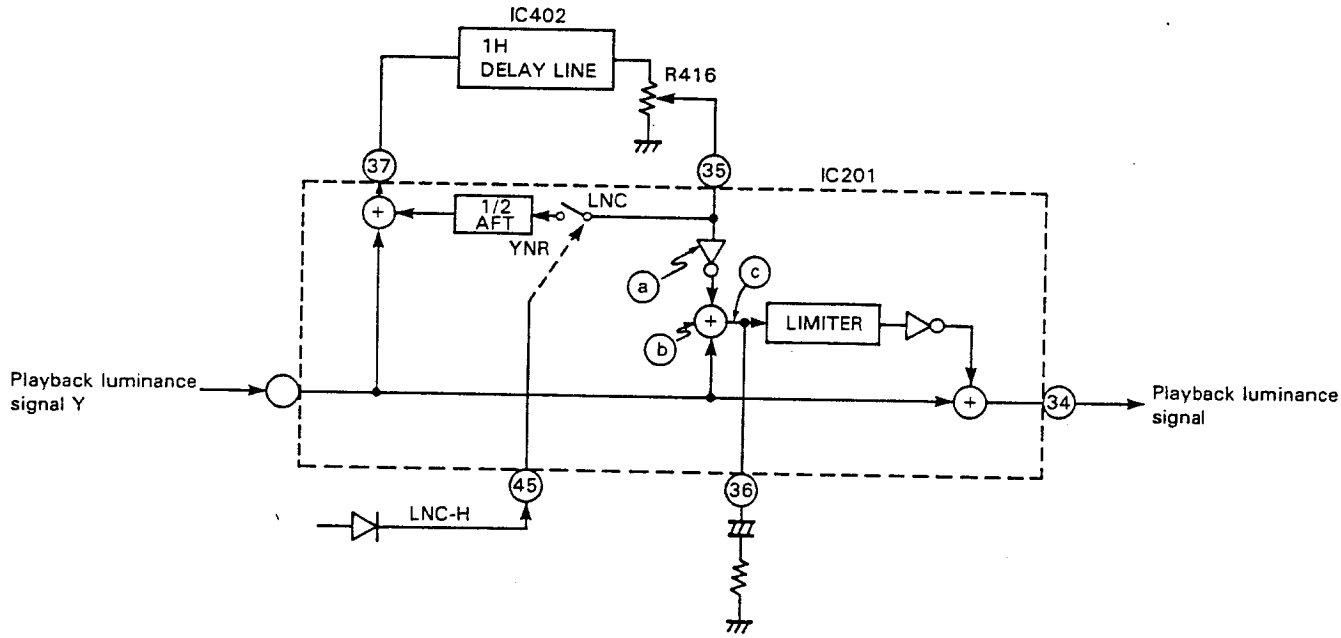



Figure 8-7.

**Subemphasis**

Subemphasis in the VHS system used to mean non-linear emphasis in LP mode. In S-VHS, the peak of subemphasis is put at a higher frequency range than in VHS, and at playback it is given the reversed characteristic to improve S/N.

The figure 8-8 shows the characteristics of subemphasis which indicates that smaller signals are particularly emphasized when recording.

In this VCR, subemphasis characteristics are obtained by IC401. 0.4 Vpp input to the IC at TP401 is regarded as 0 dB.

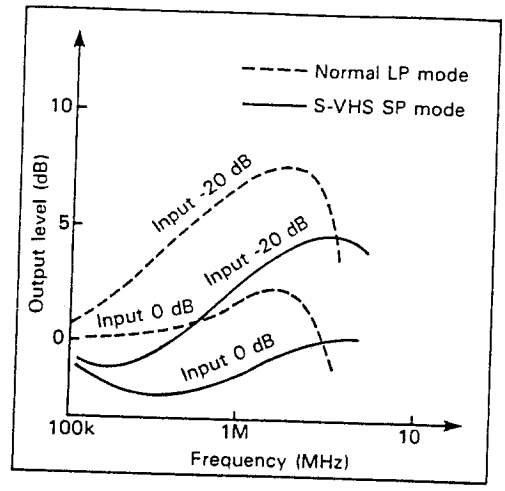
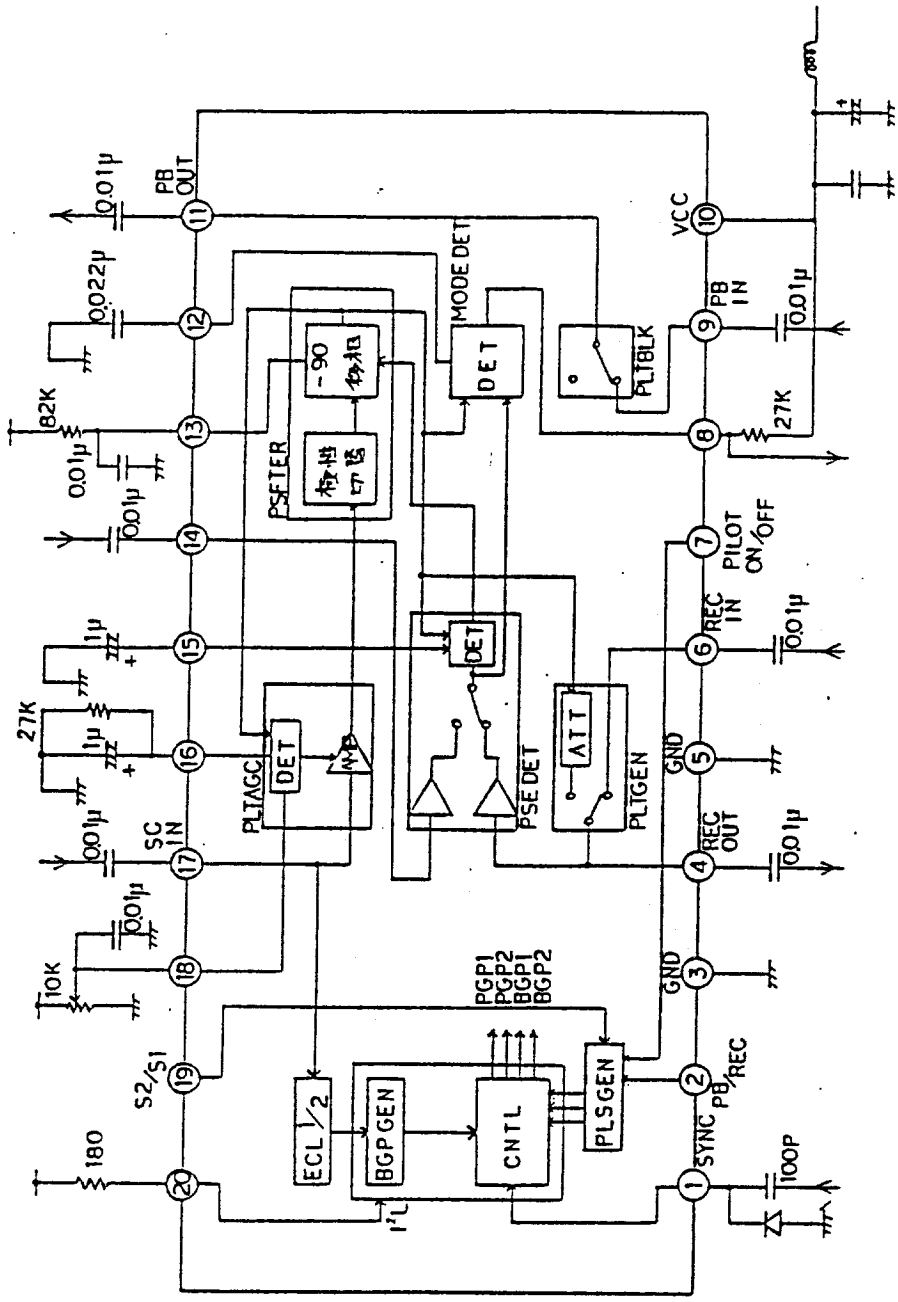



**Figure 8-8. Subemphasis Characteristics**




| | |
|---|---|
| REMARKS | SOP-20 |
| DWN. (T.KURIHARA) 89.01.27 | PROJECTION |
| CHKD. N.YAMAMOTO 89.02.01 | SCALE NTS |
| APPD. M.FURUHATA 89.02.01 | REGD. |
| TITLE | BLOCK-DIA 7"ロータ図 |
| DWG. STAMP | |
| SD TYPE D.D | 4,7 A2 |
| CLASS. | HA118117 |
| MD WORK-SPEC NO. | H |
| TAKASAKI WORKS DWG. NO. | 346 4B28872 |
| SH. | 1/E |

Hitachi, Ltd.
Tokyo Japan

HA118117FP TYPE

REVISIONS: C DATE / REVD. / C'KD. / N.P.L / SYM

PROVI. SECT. / DR

D. CHKD. / RE REGD.

REV. 0 1 2 3 4 5 6 7 8 9
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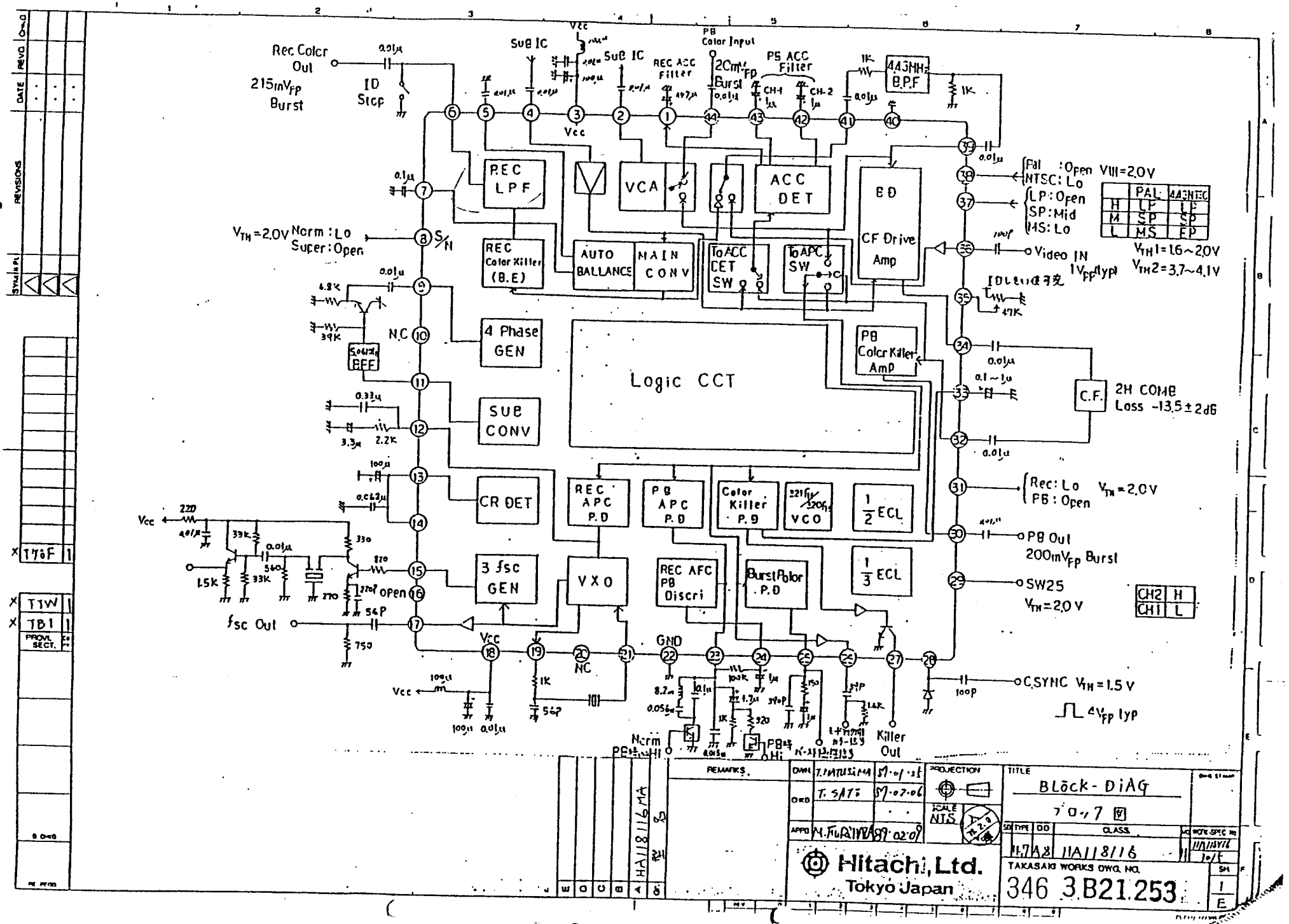


| | | | |
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| DWN | T.MATSUMA | 87-01-28 | PROJECTION |
| CKD | T. SATO | 87-02-06 | |
| APPD | M.FUKUWA | 87-02-07 | SCALE NTS |

TITLE: Block-DIAG

7017 M

| SH TYPE | DD | CLASS | NOTE SPEC NO |
|---|---|---|---|
| 1 A8 | HA118116 | | |

TAKASAKI WORKS DWG. NO.

346 3B21.253

SH 1 / E

Hitachi, Ltd.
Tokyo Japan

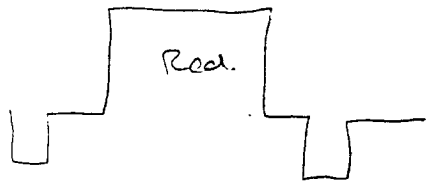
No. Eng. Mr. FUWAYAMA.

Date

# VC-S1000 S-VHS

## Y-C. CCT. Y-C Block Diagram Page 65.

FL402 has extra chroma trap to remove any extra chroma component due to the way the chroma / luma separation ckt works

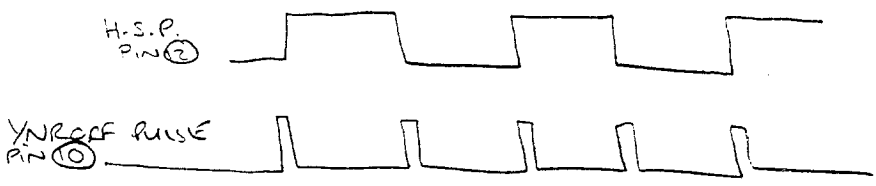



If colour changes after 2H delay to green colour can not be cancelled (Rapid Colour Change).

In this case it is detected and Q405 switches ON enabling the chroma 4.43 MHz trap inside FL402.

Traps are switched because if they were permanently connected all the time. you would lose some luminance content and resolution would be reduced. (ONLY USED IN VHS MODE, NOT S-VHS)

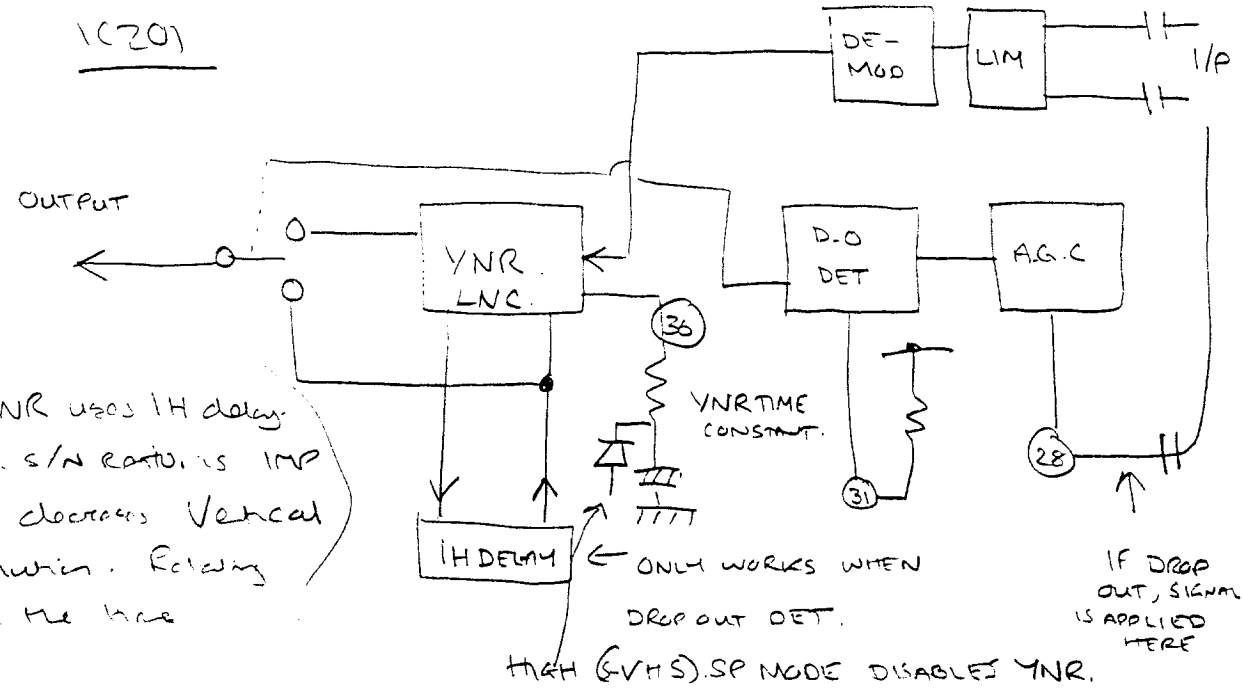
## Y NOISE REDUCTION CCT (ONLY PB)




Fed to Pin 25 of IC201 all the time, Switches off YNR during blanking period to remove jitter

LNR doesn't improve S/N ratio but does give clearer picture.
YNR - ALL MODES EXCEPT S-VHS SP.
LNC - USED ONLY IN S-VHS SP.

IC(201)

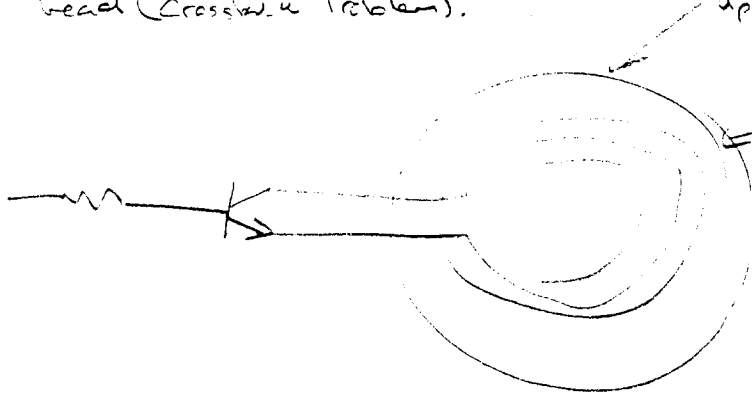



YNR uses 1H delay and S/N RATIO is IMP but decreases Vertical resolution. Relating all the time

YNR is only working for VHS MODE LP/SP OR S-VHS LP.

~~Over ride det~~. PIN 45 is switching terminal for LNR or YNR CCT. If switch is opened YNR feedback loop is ~~d~~ activated

Rotary erase head (Crosstalk Problem).




Usually one connection is S/c to prevent crosstalk but in this models all six connections to the drum are needed.

Therefore either the SP or LP head is shorted when the other is working to prevent this.

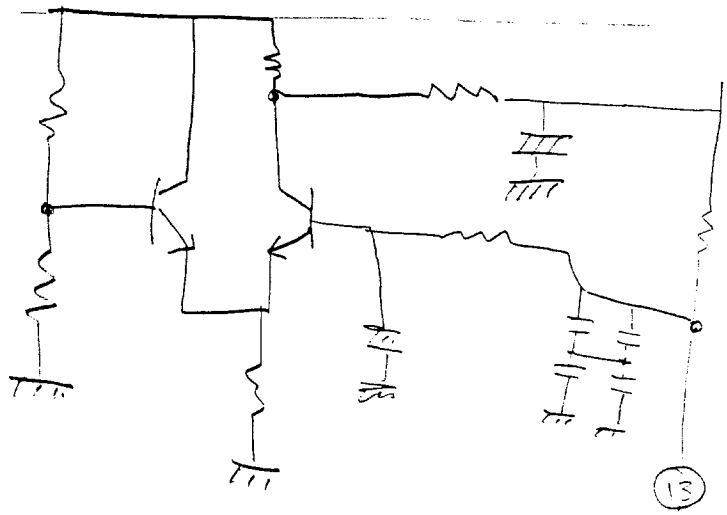
No.

Date

# IC403 Character insertion

IC403 has a blanking pulse inserted to create black level for side edge cct. (Black outline around characters)

R1112 Blank level can be changed - but it also can be misadjusted so that black level is in sync region, this will cause a problem with the a.g.c. (PIN 8) cct so a protection cct is fitted (Q111b and clamp inside IC403). Also a temperature compensation cct is fitted (Q115 R1112)




Differential amp cct to keep constant dip of pin 13 IC201 (De-emphasis)

IC201

D-1100

No

Date

## CHROMA CCT (Difference in Pilot burst chroma).

Generator is IC504.

This VCR uses 90° pilot burst phase not 270° but it doesn't matter, both are compatible.

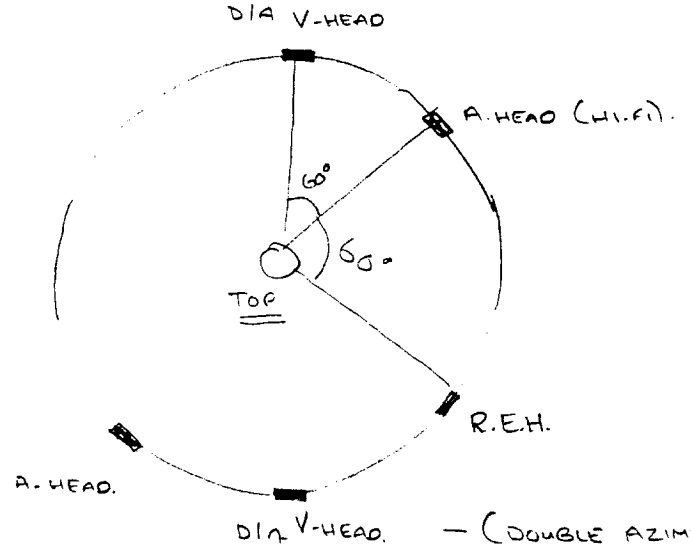
No Mr. Watanabe.

Date T.V. 2nd eng.

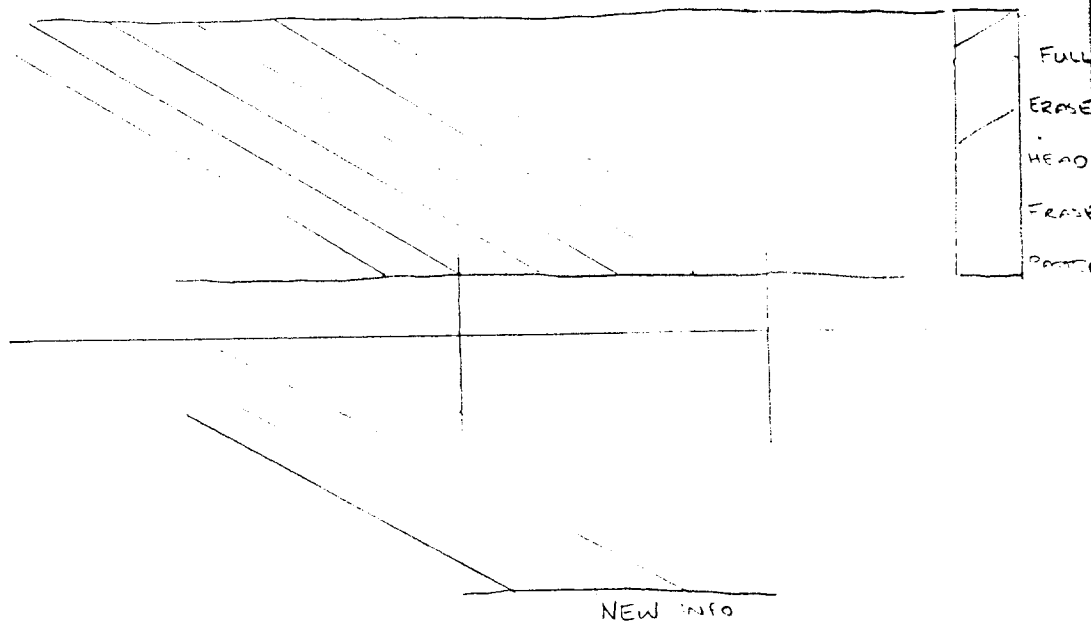
VC-S1000

## Rotary Erase Head.

Used for Insert function. (clean editing).




— (DOUBLE AZIMUTH VIDEO HEAD)



No:

Date:

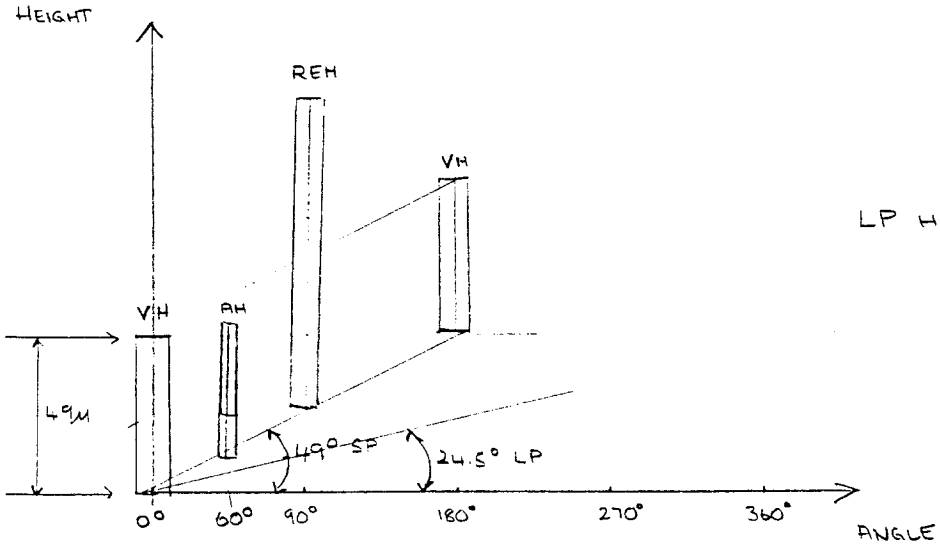
FULL ERASE HEAD ERASES VERTICALLY (NOT ALL THE TRACK WILL BE ERASED) (COLOUR NOISE, RAINBOW EFFECT).

ROTARY ERASE HEAD HAS DIFFERENT HEIGHT AND WIDTH.

ROTARY ERASE HEAD IS ABOUT TWO TRACKS

AUDIO HEAD MUST BE BEFORE VIDEO HEAD.

ROTARY ERASE IS BEFORE AUDIO + VIDEO HEAD. (TWO TRACKS HIGH.




LP HALF SPEED TAPE

ROTARY ERASE HEAD IS ALWAYS ON IN REC MODE.

DURING INSERT LINEAR AUDIO TRACK IS NOT ERASED. BUT HI-FI TRACK IS ERASED. IT IS POSSIBLE TO DUB BOTH INSERT VIDEO AND LINEAR AUDIO BUT NOT ON THIS MACHINE. IF VIDEO IS DUBBED LINEAR AUDIO IS NOT.

THIS MACHINE HAS BOTH FULL AND ROTARY ERASE HEAD.

No. Date

# VLS 860 Drum

Remove Head when played back in large VCR

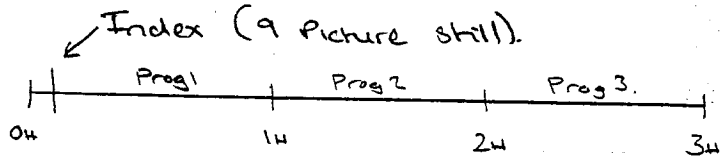
No.

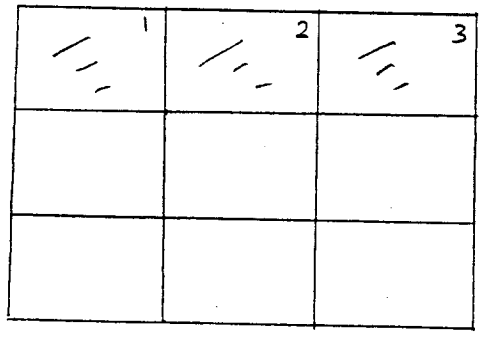
Date 1.9.84. Mr Nagayoshi. VCR 2nd eng.

## DIGITAL VCR. VC-D815 SIMILAR TO VC0805

Difference between new + old model is MVI (Multi Visual Index).

On recorded material on the tape it first records the programme and at the beginning it takes a sample into memory. It then records these samples at the beginning of the tape giving an index. Takes sample after 2 minutes, you can select the picture or it can be automatically selected. All indexes are recorded starting 10 seconds after the start of the tape. Up to 9 can be recorded on one tape.



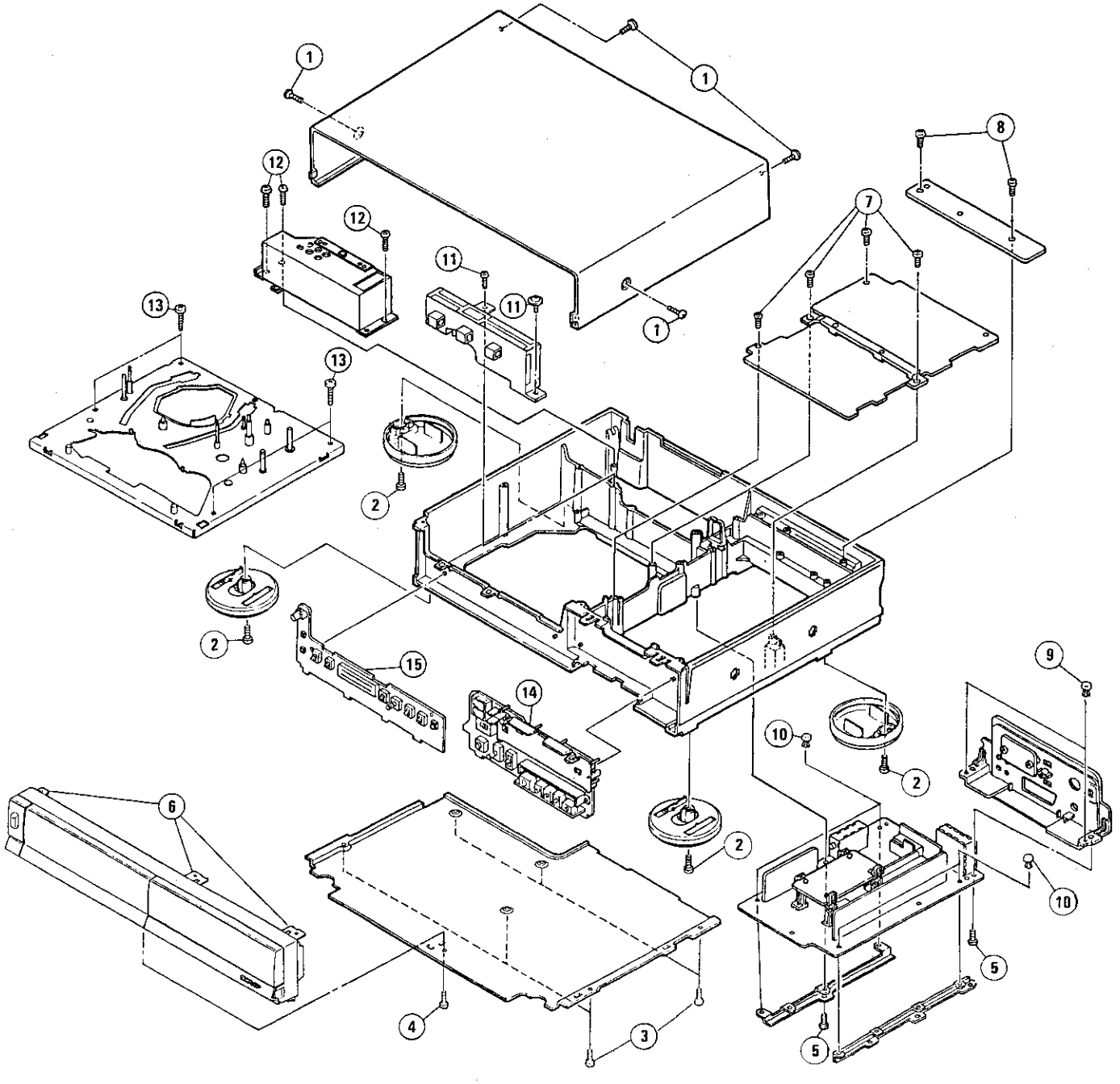




To Record index

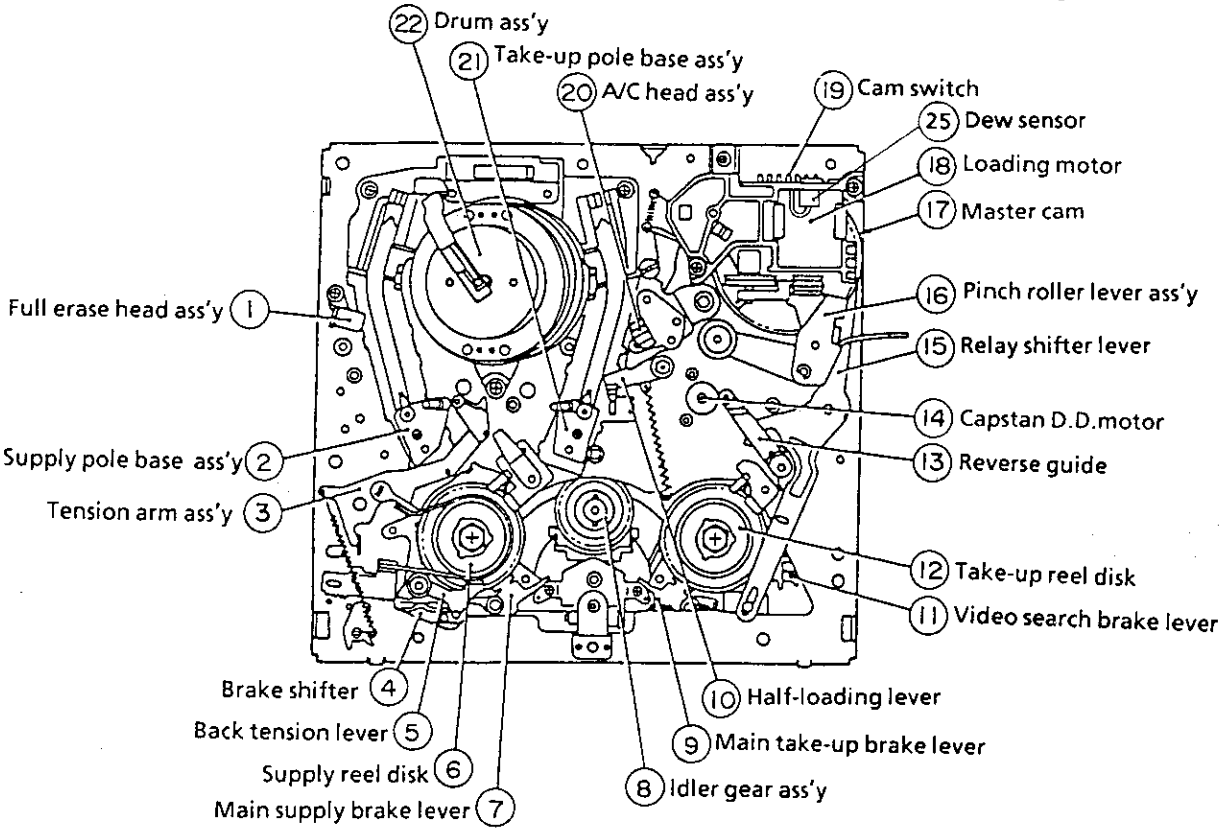
MVI switch is operated tape is rewound to beging. Then ffwd to first VISS signal, tape then stops and plays for 2 minutes. During this time a picture is taken and memorized. It then does the same thing up to 9 times (9 different programmes only).

## DISASSEMBLY AND REASSEMBLY

1. Remove the four upper cabinet fastening screws ①.
2. Remove the four decorative leg fastening screws ②.
3. Remove the six bottom panel fastening screws ③.
4. Remove the one front panel fastening screw ④.
5. Remove the two fastening screws ⑤ from the main PWB reinforcing angle and the antenna terminal cover.
6. Release the three clips ⑥ and remove the front panel.
7. Remove the four screws ⑦ from the Y/C PWB and the fixing angle.
8. Remove the two rotary erase PWB fastening screws ⑧.
9. Remove the two antenna terminal cover fastening rivets ⑨.
10. Remove the four main PWB fastening rivets ⑩.
11. Remove the two head amp PWB fastening screws ⑪.
12. Remove the three power unit fastening screws ⑫.
13. Remove the four mechanism chassis fastening screws ⑬.
14. Release the timer PWB ⑭ fastening clips.
15. Release the operation PWB ⑮ fastening clips.

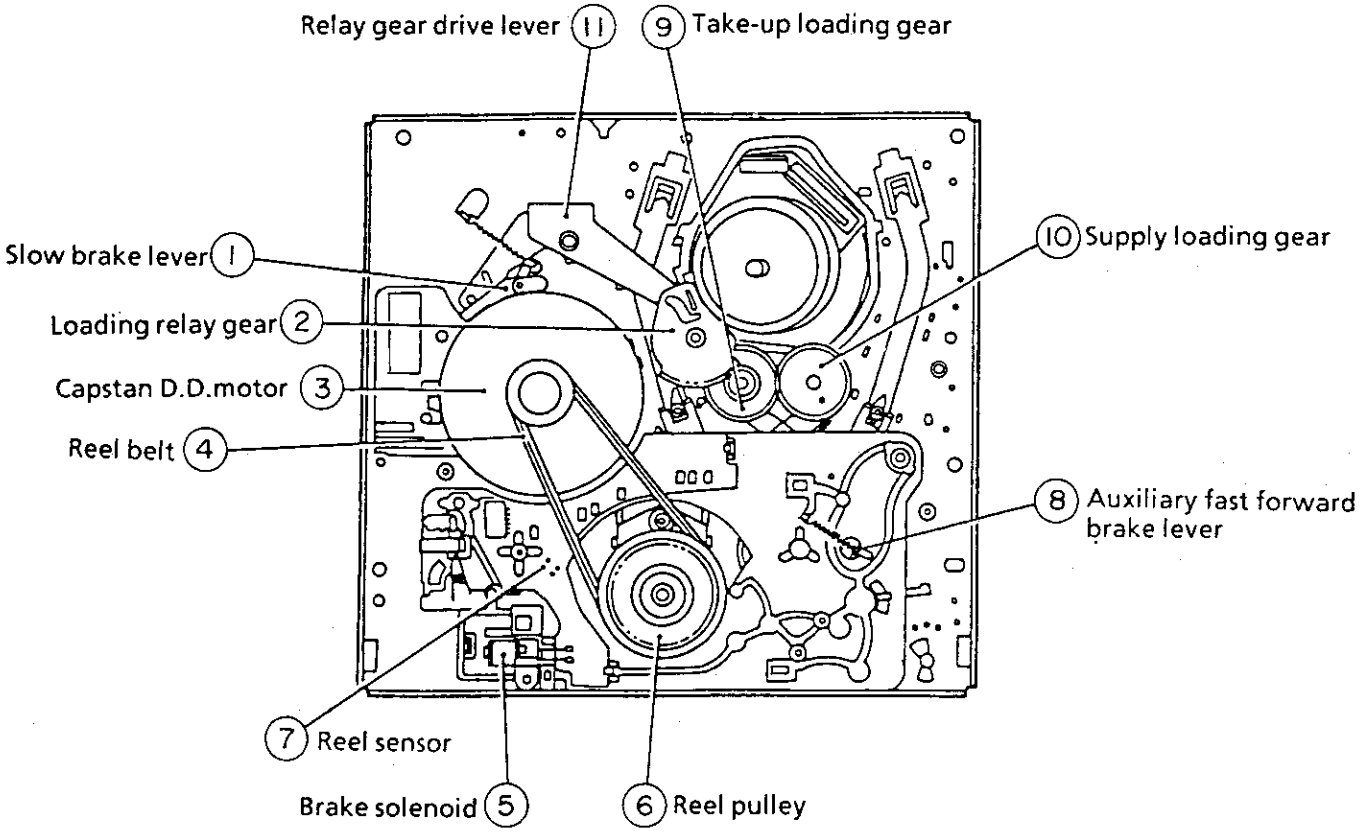


# FUNCTION OF MAJOR MECHANICAL PARTS (TOP VIEW)




| No. | Function | No. | Function |
|---|---|---|---|
| 1. | Full erase head ass'y<br>Erase the whole records on the tape in the recording mode. | 13. | Reverse guide<br>Pulls out the tape in the video search rewind mode, and controls the tape drive train height with the upper and lower guides. |
| 3. | Tension arm ass'y<br>Detects the tension of tape while running, and brakes the supply reel disk via the tension band. | 15. | Relay shifter lever<br>Transmits the operation of the master cam to the brake shifter, and operates the reverse guide. |
| 4. | Brake shifter<br>Set the position of brake or the like in accordance with the modes such as stop and playback. | 16. | Pinch roller lever ass'y<br>Press-fits the tape to the capstan during tape running. The right protrusion switches the clutch of the cassette housing control assembly in "tape eject", and makes the mechanism eject the tape. |
| 5. | Back tension lever<br>Bakes the supply reel disk to a certain degree to prevent tape slackening during "half-loading", "loading" and "shifting from playback to picture scan rewind". | 17. | Master cam<br>Turns clockwise during loading, and couterclockwise during unloading, and moves the shifter or the like in accordance with each mode. |
| 7. | Main supply brake lever<br>Brakes the supply reel disk to prevent tape slackening when the unit is stopped in fast forward or rewind mode. | 18. | Loading motor<br>A motive power which drives the mechanism. It transmits the power to the master cam and cassette housing control assembly via the belt. |
| 9. | Main take-up brake lever<br>Brakes the take-up reel disk to prevent tape slackening when the unit is stopped in fast forward or rewind mode. | 19. | Cam switch<br>Rotates synchronously with the master cam, and detects the position of each mode by means of the internal switch |
| 10. | Half-loading lever<br>Bring the tape in contact with the A/C head, putting it in half-loading state in the fast forward or rewind mode. | 25. | Dew sensor<br>An element which detects condensation inside the unit. This element is activated, when it senses condensation, to interrupt the mechanism. |
| 11. | Video search brake lever<br>It is in contact with the take-up reel disk normally, and brakes it to a certain degree. It applies larger brake in the video search rewind mode. | | |

# FUNCTION OF MAJOR MECHANICAL PARTS (BOTTOM VIEW)




| No. | Function | No. | Function |
|---|---|---|---|
| 1. | Slow brake lever<br>Gets in contact with the capstan D.D. motor linking to the master cam in the slow still mode, and brakes it to a certain degree. | 7. | Reel sensor<br>An element which sheds the light onto the reflection plate affixed to the bottom side of the reel disk, and detects the rotation of the reel disk through receiving the reflected light. |
| 3. | Capstan D.D. motor<br>A motive power which runs the tape. It transmits the power via the reel belt. | 8. | Auxiliary fast forward brake lever<br>Brakes the supply reel disk to a certain degree in the fast forward and rewind modes. |
| 4. | Reel belt<br>Transmits the power to run the tape to the reel pulley. | 9. | Take-up loading gear<br>Shifts the take-up pole base and guide roller via the loading relay gear, and applies the tape around the drum assembly, as well as transmits the power to the supply loading gear. |
| 5. | Brake solenoid<br>Adsorbs and holds the brake shifter in the fast forward and rewind modes, and releases it in the stop mode. | 10. | Supply loading gear<br>Shifts the supply pole base and guide roller via the take-up loading gear, and applies the tape around the drum assembly. |
| 6. | Reel pulley<br>Transmits the power of the capstan D.D. motor to the reel disk via the reel idler. | 11. | Relay gear drive lever<br>Transmits the movement of the master cam to the take-up loading gear via the loading relay gear. |

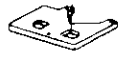
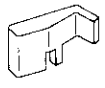
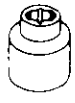
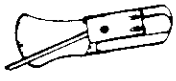
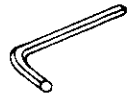
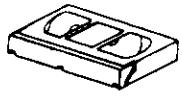
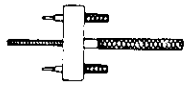
# ADJUSTMENT, REPLACEMENT AND ASSEMBLY OF MECHANICAL UNITS

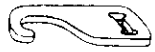
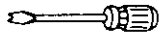
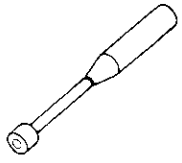
Here we will describe a relatively simple service work in the field, not referring to the more complicated repairs which would require the use of special equipment and tools (drum assembly replacement, for example).

We are sure that the easy-to-handle tools listed below would be more than handy for periodical maintenance to keep the machine in its original working condition.

## TOOLS NECESSARY FOR ADJUSTING THE MECHANICAL UNITS

The following tools are required for proper service and satisfactory repair.

| No. | Jig Item | Part No. | code | Configuration | Remarks |
|---|---|---|---|---|---|
| 1 | Reel Disk Height Adjustment Jig | JiGRH0002 | BR | | These jigs are used for checking and adjusting the reel disk height |
| 2 | Master Plane Jig | JiGMP0001 | BY |  | |
| 3 | A/C Head Tilt Adjustment Jig | JiGACH-F18 | BU |  | This Jig is used for setting the A/C head tilt. |
| 4 | Torque Gauge (90g) | JiGTG0090 | CM | | These jigs are used for checking and adjusting the torque of take-up and supply reel disks. |
| | Torque Gauge (1.2 kg) | JiGTG1200 | CN | | |
| 5 | Gauge Head | JiGTH0006 | AW |  | |
| 6 | Cassette Torque Meter | JiGVHT-063 | CZ | | This cassette torque meter is used for checking and adjusting the torque of take-up for measuring tape back tension. |
| 7 | Tension Gauge (300g) | JiGSG0300 | BF |  | There are two Gauges used for the tension measurements, 300 g and 2.0 kg. |
| | Tension Gauge (2.0kg) | JiGSG2000 | BS | | |
| 8 | Hex Wrench (0.9mm) | JiGHW0009 | AE |  | These Jigs are used for loosening or tightening special hexagon type screws. |
| | Hex Wrench (1.2mm) | JiGHW0012 | AE | | |
| | Hex Wrench (1.5mm) | JiGHW0015 | AE | | |
| 9 | Hi-Fi Alignment Tape | VROCBFFS | CB |  | These Tapes are especially used for electrical fine adjustment. |
| | Alignment Tape (PAL) | VROCPSV | CK | | |
| | S-VHS Alignment Tape | | | | |
| 10 | Drum Replacing Jig | JiGDT-0001 | BG |  | This is used for replacement of the VCR's upper drum. |

| No. | Jig Item | Part No. | Code | Configuration | Remarks |
|---|---|---|---|---|---|
| 11 | Tension Gauge Adapter | JiGADP003 | BK |  | This Jig is used with the tension gauge. Rotary Transformer Clearance Adjusting Jig. |
| 12 | Special Bladed Screwdriver | JiGDRiVERH-4 | AP |  | This Screwdriver is used for adjusting the guide roller height and X-position. |
| 13 | Tension Band and Plate Adjustment Jig | JiGDRiVER-6 | BM | | This Jig is used for adjusting the tension band and tension plate. |
| 14 | Torque Driver (5kg) | JiGTD1200 | CB | | This is used to screw down resin-made parts: the specified torque is 5 kg. |
| 15 | Box Driver | JiGDRiVER110-7 | AS |  | This Jig is used for height adjustment of the A/C head. |
| | | JiGDRiVER110-4 | AV | | This Jig is used for height adjustment of the retaining guide. |
| 16 | Retaining Guide Height Adjustment Jig | JiGGH-F18 | BU | | This Jig is used for height adjustment of the retaining guide. |
| 17 | Reverse Guide Height Adjustment Jig | JiGRVGH-F18 | BU | | This Jig is used for height adjustment of the reverse guide. |

**NOTE:**
Current JiGMA0001 contains Master Plane (JiGMP0001) and Disk Height Adjusting Jig (JiGRH0001).
Even though new Disk Height Adjusting Jig (JiGRH0002) covers greater height, this new Jig (JiGRH0002) can be used for current JiGRH0001, but current Jig (JiGRH0001) cannot be used as JiGRH0002.
Master Plane (JiGMP0001) can be used with JiGRH0001 and JiGRH0002 as well.

## MECHANICAL PARTS REQUIRING PERIODICAL INSPECTION

Use the following table as a guide to maintain the mechanical parts in good operating condition.

| Parts \ Maintained | 500 hrs. | 1000 hrs. | 1500 hrs. | 2000 hrs. | 3000 hrs. | Possible symptom encountered | Remarks |
|---|---|---|---|---|---|---|---|
| Guide roller ass'y | □ | □ | □ | □ | □ | Lateral noises<br>Head occasionally blocked | Abnormal rotation or significant vibration requires replacement. |
| Supply impedance roller | □ | □ | □ | □ | □ | | |
| Supply impedance roller (inner hole and shaft) | | □ | | □ | □ | | Clean with pure high quality isopropyl alcohol. |
| Supply impedance roller flange B | □ | □ | □ | □ | □ | | Clean tape contact part with the specified cleaning liquid. |
| Retaining guide | □ | □ | □ | □ | □ | | |
| Slant pole | □ | □ | □ | □ | □ | | |
| Video head | □ | ○□ | □ | ○□ | ○□ | Poor S/N ratio, no colour | Clean tape contact area with the specified cleaning liquid. |
| Full-erase head | □ | □ | □ | □ | □ | Poor colour, beating | |
| A/C head | □ | □ | □ | □ | □ | Sound too small or distorted | |
| Capstan D.D. Motor | □ | □ | □ | □ | ○ | No tape running, uneven colour | |
| Pinch roller | □ | □ | □ | □ | ○ | No tape running, tape slack | Clean rubber and rubber contact area with the specified cleaning liquid. |
| Reel belt | | □ | | ○ | □ | No tape running, tape slack, no fast forward/rewind motion | |
| Loading belt | | □ | | ○ | □ | Cassette not loaded or unloaded | |
| Cassette loading belt | | □ | | ○ | □ | | |
| Tension band ass'y | | | | | ○ | Lateral image swing | |
| Loading Motor | | | | | ○ | Cassette not loaded or unloaded | |
| Reel block* | | | | | | See the chart below. | |
| *See the table below for servicing the reel block parts. | | | | | | | |
| Supply/take-up reel disks | | □△ | | △○ | □△ | No tape running, tape slack | Clean with pure high quality isopropyl alcohol. |
| Video search brake lever | | | | ○ | | | |
| Idler gear ass'y | | | | ○ | | No tape running | |
| Reel Pulley | | □△ | | ○□ | □△ | | |
| Main supply/take-up brake levers | | | | ○ | | Tape slack | |

**NOTE:** ○: Part replacement.
□: Cleaning (For cleaning, use a lint-free cloth dampened with pure isopropyl alcohol).
△: Oil refilling (The indicated point should be lubricated with high quality spindle oil every 1000 hrs).

If the reading is out of the specified value, clean or replace the part.

## REMOVAL AND REASSEMBLY OF CASSETTE HOUSING CONTROL ASSEMBLY

- **Removal**

1. Set the cassette ejected condition in the cassette eject mode.
2. Unplug the recorder from the main source.
3. Follow the procedures below in the specified order.
   a) Remove the cassette loading belt ①.
   b) Disconnect the FFC (full Flat Cable) ②.
   c) Remove the cassette housing installation screws ③.
   d) Slide and pull out the cassette housing control assembly upward ④.

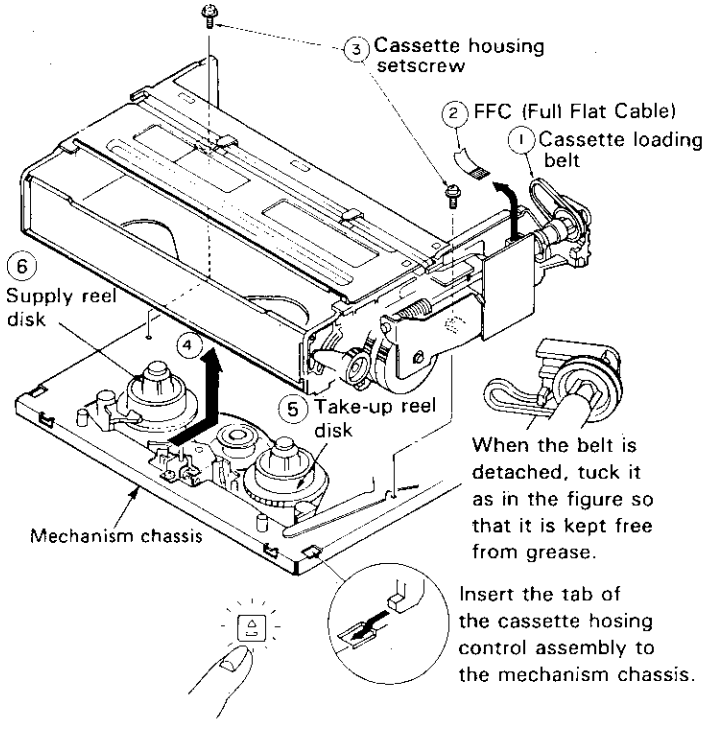

③ Cassette housing setscrew
② FFC (Full Flat Cable)
① Cassette loading belt
⑥ Supply reel disk
④
⑤ Take-up reel disk
When the belt is detached, tuck it as in the figure so that it is kept free from grease.
Mechanism chassis
Insert the tab of the cassette hosing control assembly to the mechanism chassis.

Figure 1-1.

- **Reassembly**

1. Before installation of the cassette housing control assembly, place the unit in the stop mode with the power on, then unplug the power cord. (The main body is placed in the eject mode.)
2. Follow the procedures for removal in the reverse order.

**Notes:**

1. Be sure to unplug the power cord in removal and reassembly.
2. Keep the cassette loading belt free from grease. In case of its adhesion, clean the belt.
3. In using a magnet screw driver, be sure to keep it away from the A/C head, FE (Full Erase) head, or the drum.
4. In removal and reassembly, take care not to hit the cassette housing control assembly or tools against the guide pin, drum, or the like thereabout.
5. Place the unit in the eject mode in removal or reassembly of the cassette housing control assembly.
6. Load the cassette once onto the cassette housing control assembly after reassembly. (If the cassette housing control assembly normally operates after this, the phases of mechanism and the cassette controller are accurately adjusted after ejection.)

## MECHANICAL OPERATION CHECK WITHOUT CASSETTE

When power is on, the general operations of the mechanism can be checked without a cassette. Note the following points.

1. Check video search rewind and rewind, rotating the take-up reel disk ⑤ by hand (in either normal or reverse direction). If it is not rotated, the reel sensor works to shift the mechanism to the eject mode.
2. When the stop button is pressed, the mechanism does not stop at a normal stop position. It shifts to the eject mode and stops.
3. When the stop button is pressed in the playback, video search rewind, and video search forward modes, the supply reel disk ⑥ keeps on rotating for several seconds for elimination of tape slack in the course of shifting to the eject mode. In such a case, rotate the take-up reel disk ⑤ somewhat by hand, and the supply reel disk ⑥ stops, which can reduce the working time.

## REPLACEMENT OF WORM WHEEL ASSEMBLY

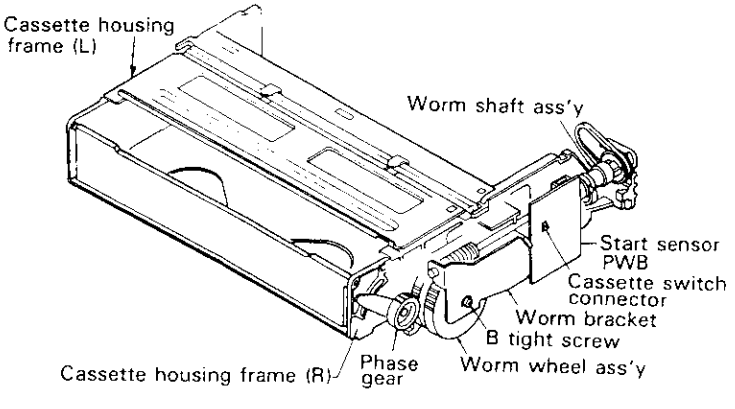
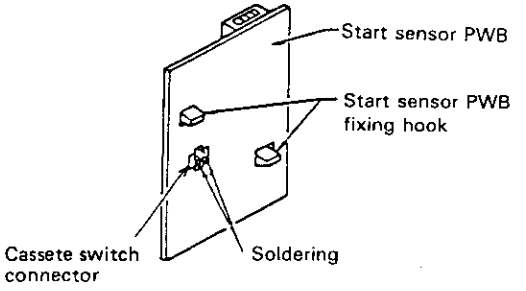



Figure 1-2.

- **Removal**

1. Unsolder the cassette switch connectors (No. 16, 17) from the start sensor PWB.




Figurer 1-3.

2. Lift the start sensor PWB pressing the two start sensor PWB fixing hooks inward.

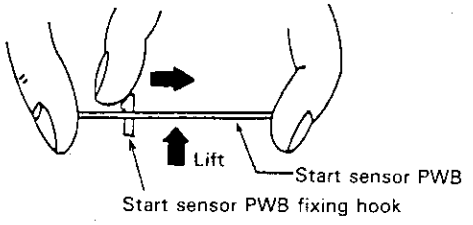



Figure 1-4.

3. Unscrew one B tight screw to detach the worm bracket.
   **Note:** The worm shaft bearing can easily come out of position. So be careful not to lose it.

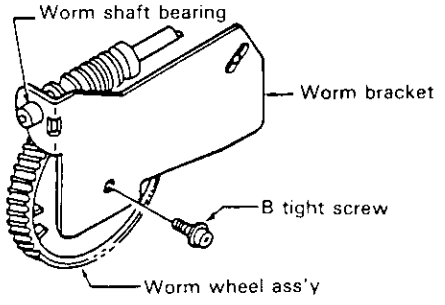



Figure 1-5.

4. Remove the worm shaft assembly, pulley, and cassette loading belt all from the cassette housing frame (R).

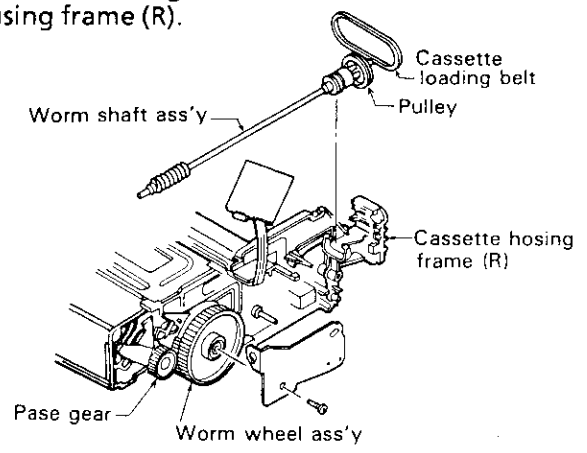



Figure 1-6.

5. Place the slider pin just above the worm wheel (Figure 1-7). (The retainer of the slider is locked at two positions hen. So unlock it as in the Figure 1-8.)
6. Pull out the worm wheel assembly toward you pressing the switch lever upward. (Figure 1-7)

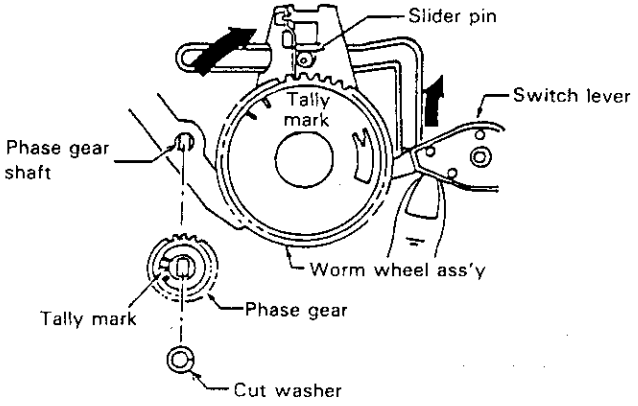



Figure 1-7.

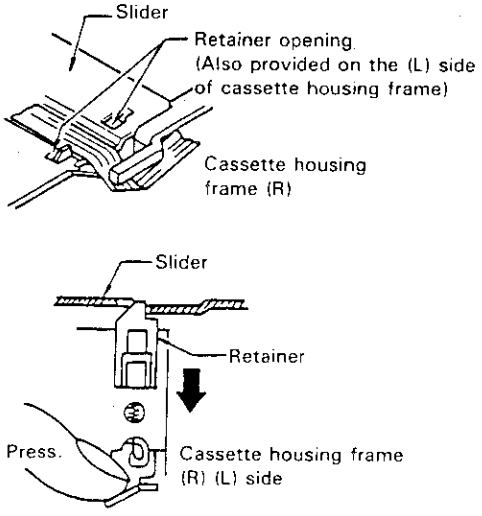
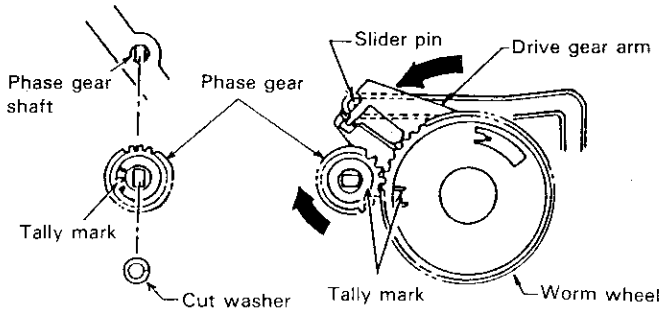



Figure 1-8.

- **Reassembly**

1. Turn the phase gear clockwise until the slider comes to a halt in the cassette insertion direction. (See the Figure 1-9.)
2. Insert the set up worm wheel gear assembly into the cassette housing frame (R), matching the mark on the phase gear with the mark on the worm wheel gear. Detach the cut washer on the phase gear assembly and the phase gear for easier installation of worm wheel assembly.
   **Note:** Make sure that the slider pin is in the groove of the drive gear arm.




(a) (b)

**Figure 1-9.**

3. Install the pulley and the cassette loading belt on the worm shaft assembly. Couple the clutch to the clutch lever. And mount them together in the cassette housing frame (R).
   **Note:** Keep in mind that the clutch switching lever should be in the correct position. The mechanism might malfunction if the lever is slightly out of position. (See page 12.)

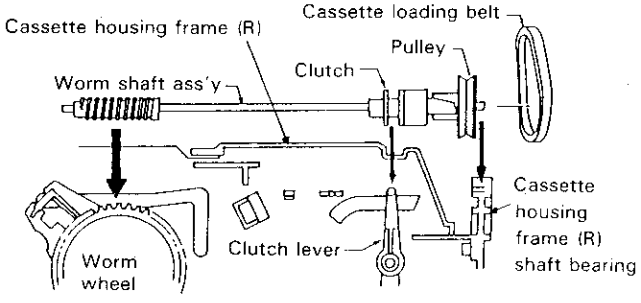



**Figure 1-10.**

4. Attach the worm bracket to the worm shaft assembly. Place them onto the boss on the cassette housing frame (R).
   **Note:** Insert ① before screwing into ② and ③.

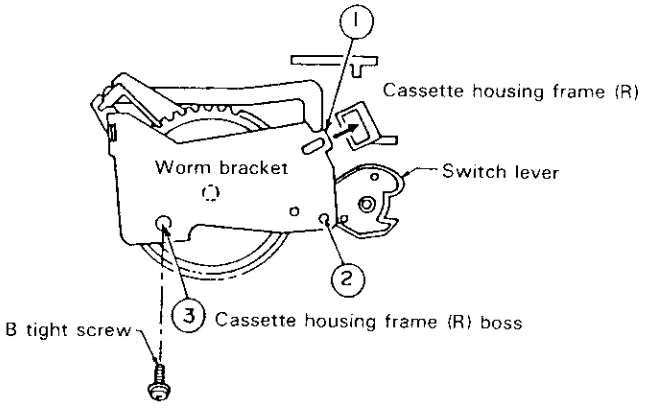
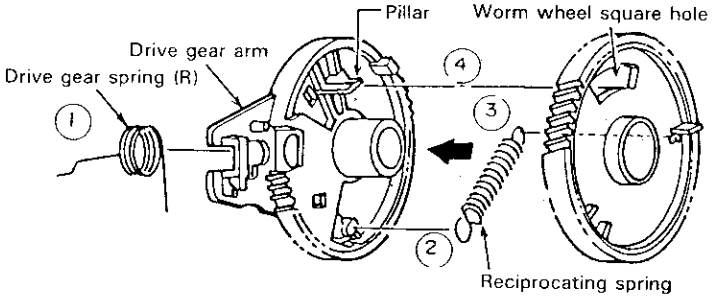


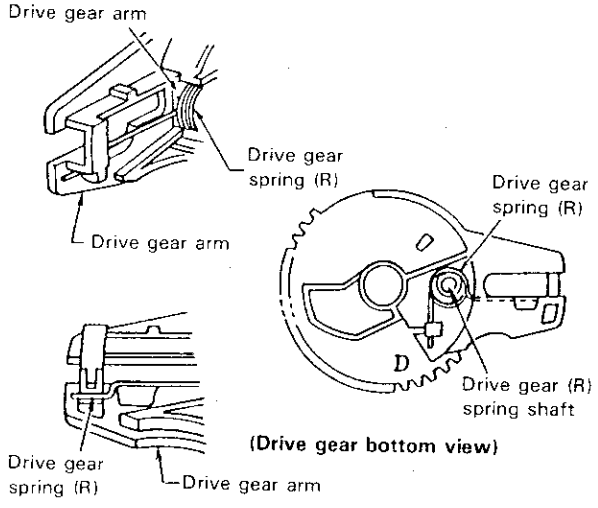

**Figure 1-11.**

5. Tighten one B tight screw.
   **Note:** Do not overtighten the B tight screw (no more than 5.0 ± 0.5 kg.cm), because the lower threads of the screw hole at the resin-mode boss can be broken.
6. Place the start sensor PWB on the cassette housing frame (R).
   **Note:** Check that the switch connectors (No. 16, 17) are in the cassette switch mounting hole.
7. Finally resolder the cassette switch connector to the start sensor PWB.

## REASSEMBLY OF DRIVE GEAR




(a)




(b)

**Figure 1-12.**

1. Pass the tip of the drive gear spring (R) ① through the square hole of the drive gear (R) to hook the spring in position.
2. Hook one end ② of the reciprocating spring to the catch of the drive gear (R).
3. Hook the other end ③ of the reciprocating spring to the catch of the worm wheel.
4. Insert the pillar ④ of the drive gear (R) into the square hole of the worm wheel. Turn the worm wheel somewhat counterclockwise for insertion of the worm wheel to the drive gear (R), because the reciprocating spring is at work.

## REPLACEMENT OF CASSETTE LOADING BELT

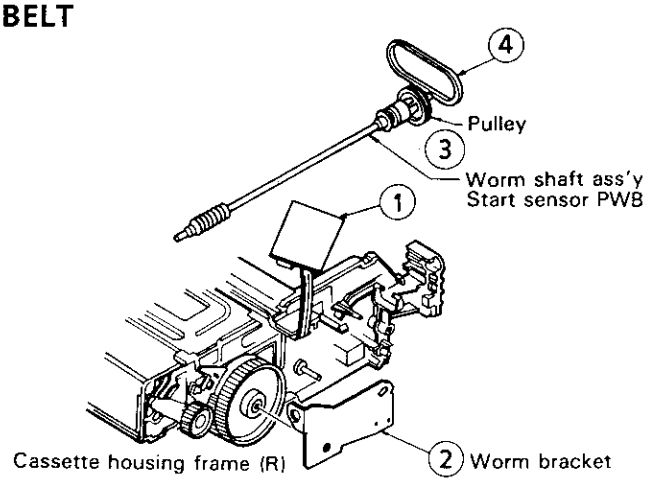



**Figure 1-13.**

1. Remove the start sensor PWB ① and worm bracket ② from the cassette housing frame (R).
2. Remove the worm shaft assembly ③.
3. Replace the cassette loading belt ④ with a new one.

**Notes:**

1. Do not overtighten the B tight screw which holds the worm bracket in position. The specified torque is 5.0 ± 0.5 kg.cm.
2. Make sure that the cassette loading belt is free from grease. If stained with grease, clean the belt with the cleaning liquid.
3. Perform checking of the clutch switch lever for proper action.

## CHECKING THE CLUTCH SWITCH LEVER

- **Checking**

Place the mechanism in the cassette eject mode when removing and attaching the cassette housing from and to the mechanism chassis.
Make sure enough that each part in the cassette housing such as the clutch switch lever is in position. If not, it causes malfunction.

**Note:**

Figure 1-14 shows the position of each part in the cassette eject mode.

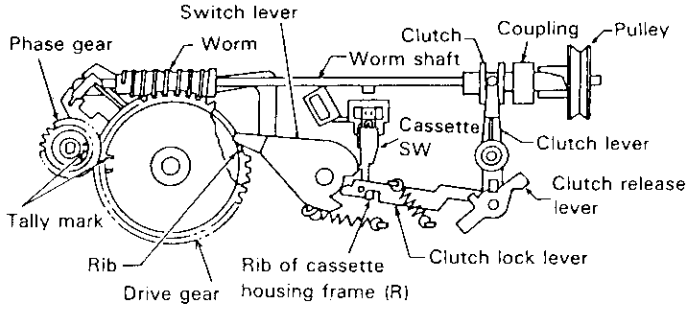
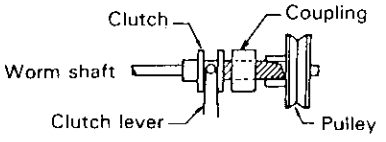



**Figure 1-14.**

1. First make sure that the tip of the switch lever is held at the rib of the drive gear (R).
2. Check that the rib of the cassette housing frame (R) and the concavity of the clutch lock lever are engaged.
3. Finally be sure that the relationship between the clutch lever and the clutch, as well as between the clutch and the pulley, are correct as in the Figure 1-15.




Check that the clutch is engaged with the pulley through the coupling.

**Figure 1-15.**

- **Resetting**

Take the following steps to reset the clutch if it is unlocked or if the switch lever and the clutch lock lever are unlocked.

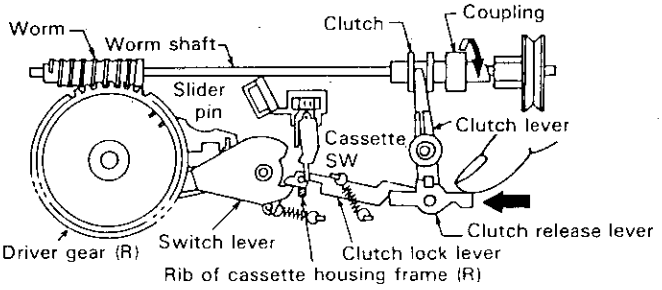


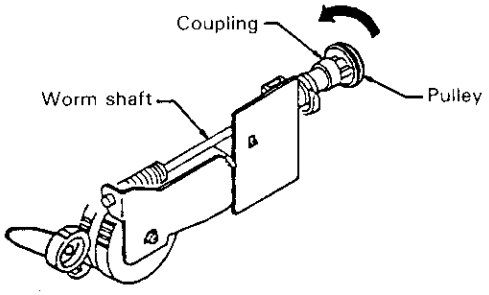

**Figure 1-16.**

1. Shift the slider by turning the coupling in the arrow direction (clockwise) until the slider pin is at the bottom of the slider groove as shown in the Figure 1-16. (The loading mode)
   **Note:** Note that the slider is equipped with a lock meachanism. Unlock the locks on cassette dousing frame (L) and (R) side before shifting the slider.
2. When the position is set as shown in the Figure 1-16, push the clutch release lever in the direction of the arrow by hand until the clutch lock lever becomes tightly locked by the rib of the cassette housing frame (R).
3. Then turn the coupling counterclockwise until the slider reaches the cassette insertion opening and the reciprocating spring is activated.
   **Note:** There is no need to unlock the slider when shifting the slider to the cassette insertion opening. Just keep shifting the slider.

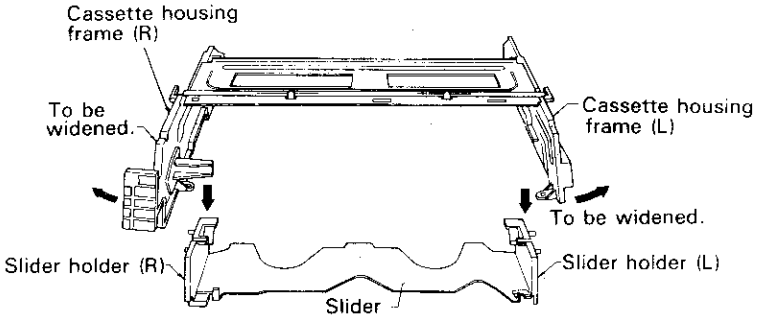
## REPLACEMENT OF LOCK RELEASE LEVER

- **Removal**

1. Place the slider in the cassette down position. (Turn the coupling on the worm shaft clockwise until the slider is in the cassette down position.)
   **Note:** Before shifting, unlock the slider.
2. Slightly widen the cassette housing frames (R) and (L) to unhook the slider holders (R) and (L) of the slider assembly off the grooves of the cassette housing frames.




(a)




(b)

Figure 1-17.

3. Lift the slider holder (R) upward about 2mm off the slider by pressing two catches with a thin tip screw driver. Take care not to damage the catches.

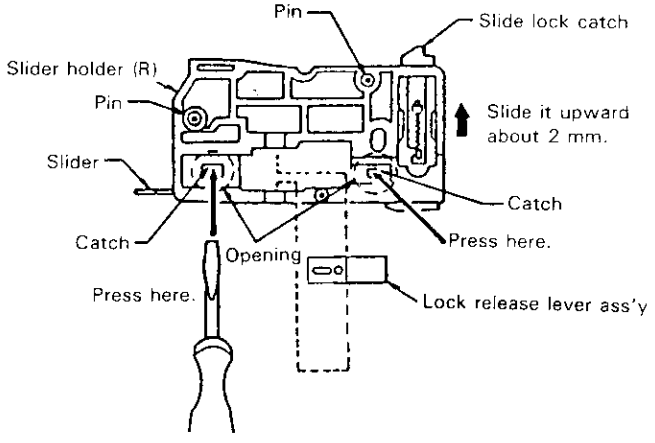



Figure 1-18.

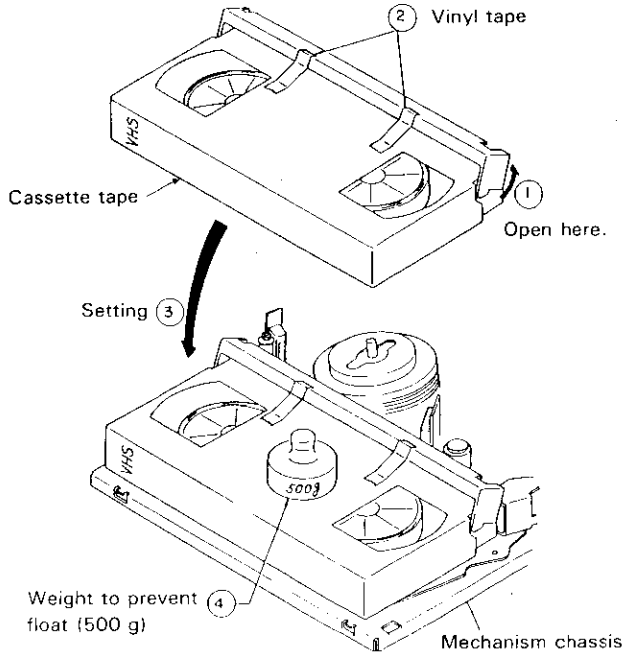
4. Remove the lock release lever ass'y from the slider holder (R)

- **Reassembly**

1. Follow the steps for removal in the reverse order. (See Figures 1-17 and 1-18.)
2. Attach the lock release lever ass'y to the slider holder (R).
3. Slide the slider holder (R) downward so that the two catches of the slider holder (R) fit the opening of the slider.
4. Slightly widen the cassette housing frames, and set the pins of slider holders (R) and (L) into the grooves of the cassette housing frames.
   **Note:** Check if the pins of the slider holders (R) and (L) fit the grooves of the cassette housing frames, and if the drive gear arm is sufficiently engaged with the slider holders.
5. Turn the coupling counterclockwise until the slider is at the cassette insertion opening.

## TO RUN A TAPE WITHOUT THE CASSETTE HOUSING CONTROL ASSEMBLY

1. Plug in the power cord.
2. Turn on the power switch.
3. Open the lid ① of a cassette tape by hand.
4. Hold the lid with a piece of vinyl tape ②.
5. Set te cassette tape in the mechanism chassis.
6. Weight the cassette tape with a weight ④ to prevent float.
7. Perform running test.




**Note:** The weight should not be more than 500 g.

Figure 1-19.

## REPLACEMENT AND HEIGHT CHECKING AND ADJUSTMENT OF REEL DISKS

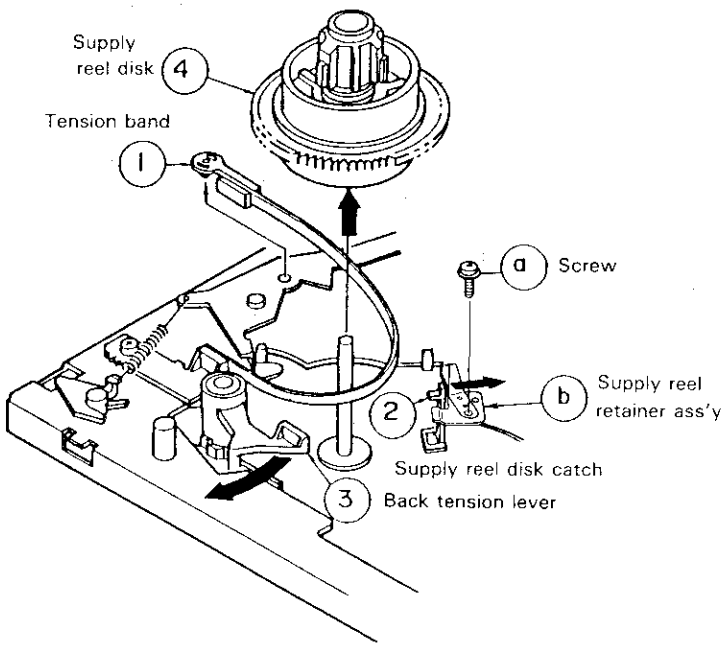
1. Remove the cassette housing control assembly.
2. Set the mechanism in the playback mode with no cassette tape in place. Unplug the power cord.
3. Set the idler gear in the center (neutral).

- **Removal (Supply reel disk)**

1. Remove the tension band ①. (Take care not to deform it.)
2. Unscrew the screw ⓐ and remove the supply reel retainer assembly ⓑ.
3. Release the supply reel disk catch and back tension lever ③.
4. Pull the supply reel disk upward.

**Notes :**

1. Take care not to deform the tension band.
2. Check and adjust the tension pole position. (See page 19.)
3. Be careful not to damage the gear and the idler gear on the supply reel disk.
4. Press the tension band in the direction of the arrow for removal.( See figure 1-20(b))




(a)

**Note:** When the tension band is pressed in the direction of the arrow for removal, the catch is hard to be deformed.

(b)

**Figure 1-20.**

- **Removal (Take-up reel disk)**

1. Unscrew the screw ⓒ and remove the take-up reel retainer.
2. Release the take-up reel disk catch ①.
3. Pull the take-up reel disk ② upward.

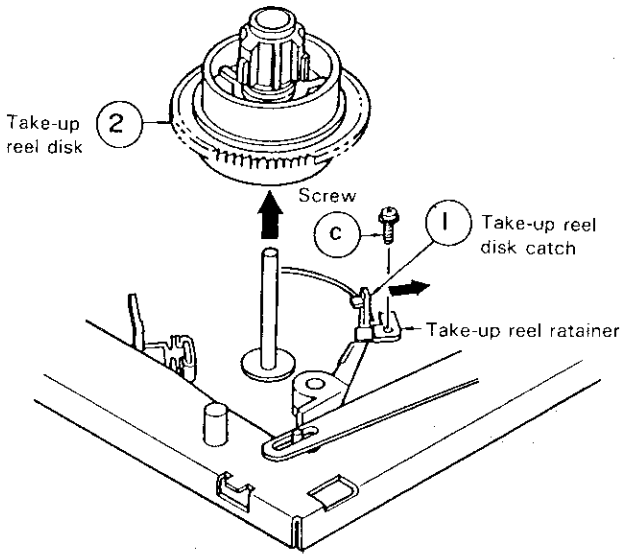



**Figure 1-21.**

- **Reassembly (Supply reel disk)**

1. Clean the reel disk shaft ① and apply oil to it.
2. Release the supply reel disk catch ② and back tension lever ③.
3. Install a new supply reel disk ④ onto the shaft.
4. Replace the tension band ⑤ around the supply reel disk, and insert it to the hole of the tension arm.
5. Replace the supply reel retainer assembly ⓑ in place, and tighten up the screw ⓐ.

**Notes :**

1. Take enough care not to deform the tension band during installation of the supply reel disk.
2. Be careful not to damage the supply reel disk gear, back tension lever, catch, or the like with tools.

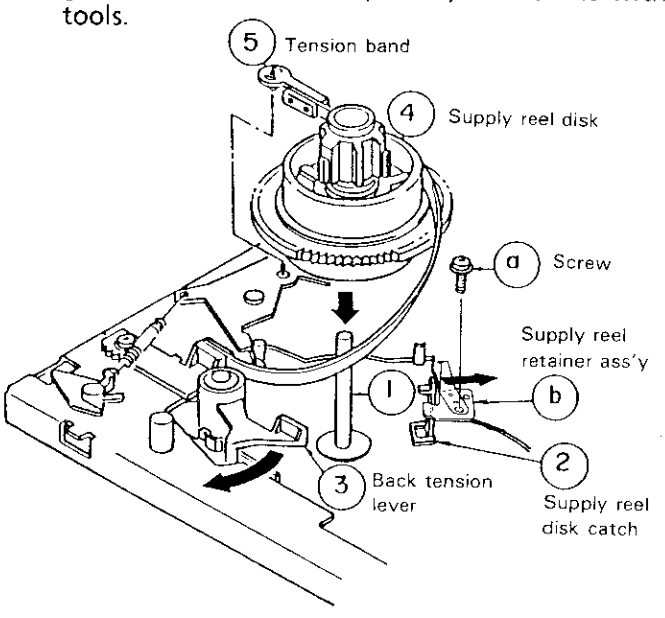



**Figure 1-22.**

- Reassembly (Take-up reel disk)

1. Clean the reel disk shaft ① and apply oil to it.
2. Release the take-up reel catch ② and video search brake lever ③.
3. Install a new take-up reel disk ④ onto the shaft.
4. Replace the take-up reel retainer ⑤ in position and tighten up the screw ⓒ.

**Note :**
Take care not to damage the video search brake lever.

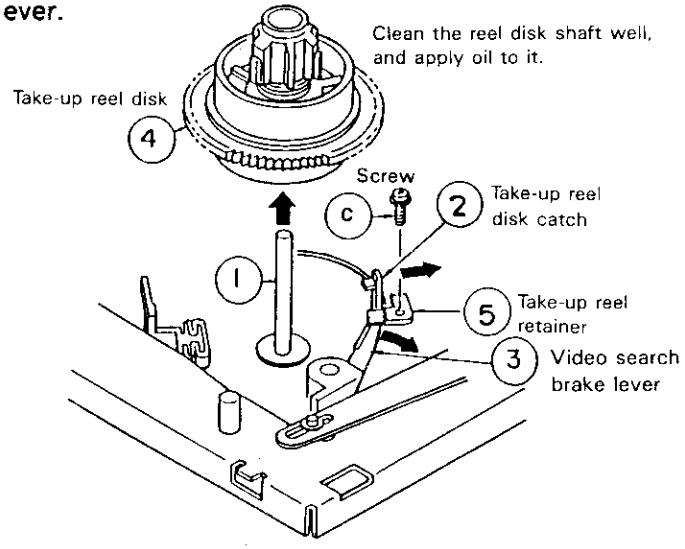



**Figure 1-23.**

* After reassembly, check the video search rewind back tension (see page 18), and check the brake torque (see page 20).

- **Height checking and adjustment**

**Note:**
Place the master plane onto the mechanism unit, taking care not to hit the drum (see Figure 1-24)

1. For height adjustment, press the reel disk with a finger, and turn it right and left with a screwdriver (see Figure 1-26 (a)).

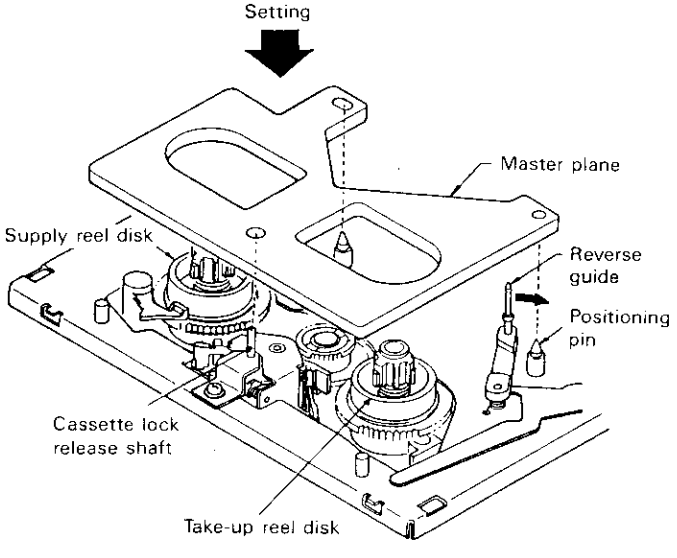



**Figure 1-24.**

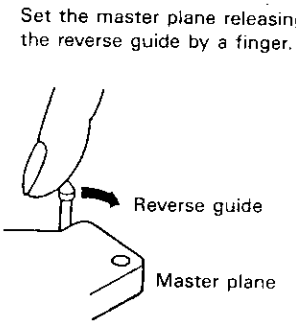
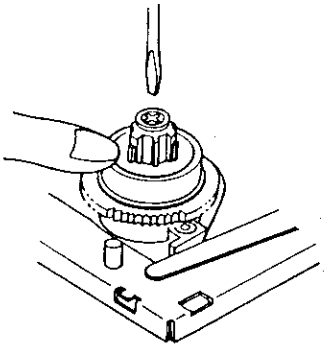


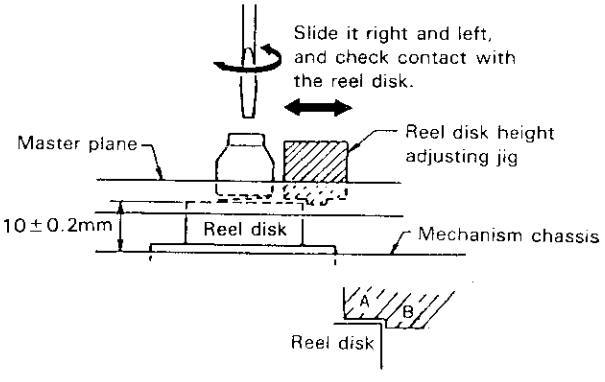

**Figure 1-25.**

2. Check that the reel disk is lower than part A but higher than part B. If the height is not correct, adjust the height adjusting screw (see Figure 1-26 (b)).

**Note :**
Whenever replacing the reel disk, perform the height checking and adjustment.



(a)




(b)

**Figure 1-26.**

## CHECKING AND ADJUSTMENT OF TAKE-UP TORQUE IN FAST FORWARD MODE

- Remove the cassette housing control assembly.
- **Setting**

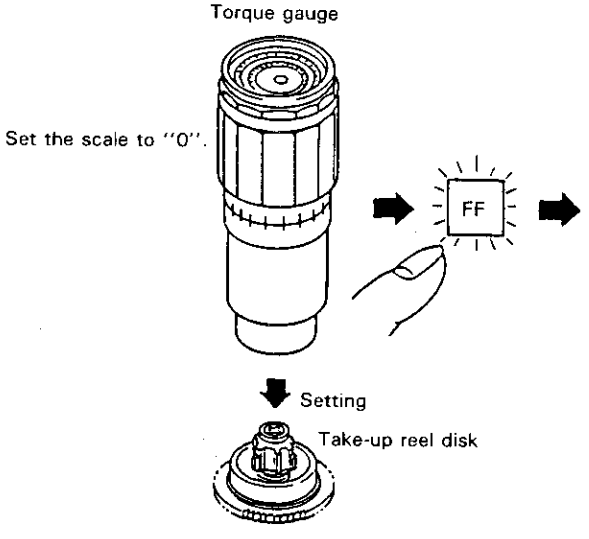



**Figure 1-27.**

- **Checking**

Turn the torque gauge slowly (one rotation every 2 to 3 seconds) by hand in the take-up direction

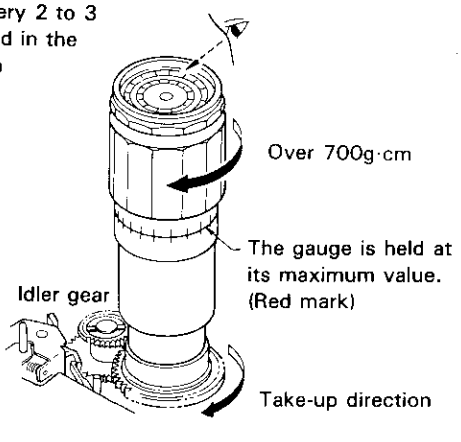



**Figure 1-28.**

- **Adjustment**

1. If the take-up torque is outside the range, clean the capstan D.D. motor pulley, reel belt and reel pulley with cleaning liquid, then recheck the torque.
2. If the take-up torque is still out of range, replace the reel belt.

**Notes :**

1. Hold down the torque gauge so that it may not fly off.
2. When checking the take-up torque, do not keep the reel disk locked for a longer time.

## CHECKING AND ADJUSTMENT OF TAKE-UP TORQUE IN REWIND MODE

- Remove the cassette housing control assembly.
- **Setting**

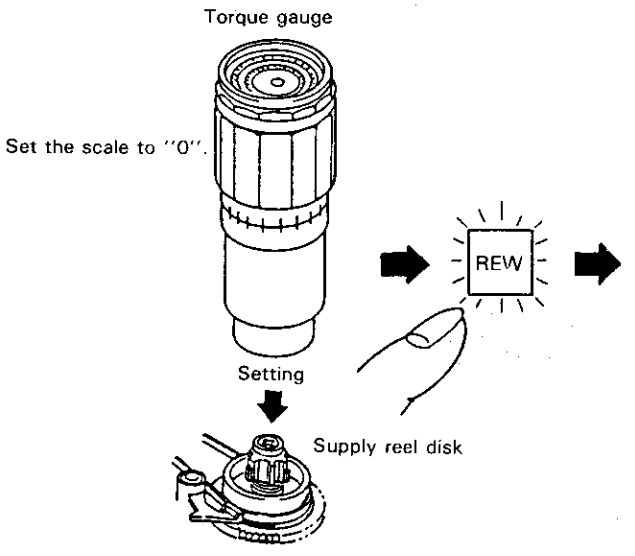



**Figure 1-29.**

- **Checking**

Turn the torque gauge slowly (one rotation every 2 to 3 seconds) by band in the take-up direction

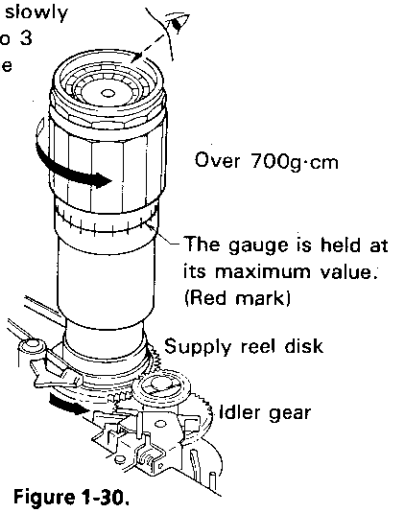



**Figure 1-30.**

- **Adjustment**

1. If the take-up torque is outside the range, clean the capstan D.D. motor pulley, reel belt and reel pulley with cleaning liquid, then recheck the torque.
2. If the take-up torque is still out of range, replace the reel belt.

**Notes :**

1. Hold down the torque gauge so that it may not fly off.
2. When checking the take-up torque, do not keep the reel disk locked for a longer time.

## CHECKING AND ADJUSTMENT OF TAKE-UP TORQUE IN PLAYBACK MODE

1. Remove the cassette housing control assembly.
2. Open the lid of the cassette torque meter, and hold it with a piece of vinyl tape.

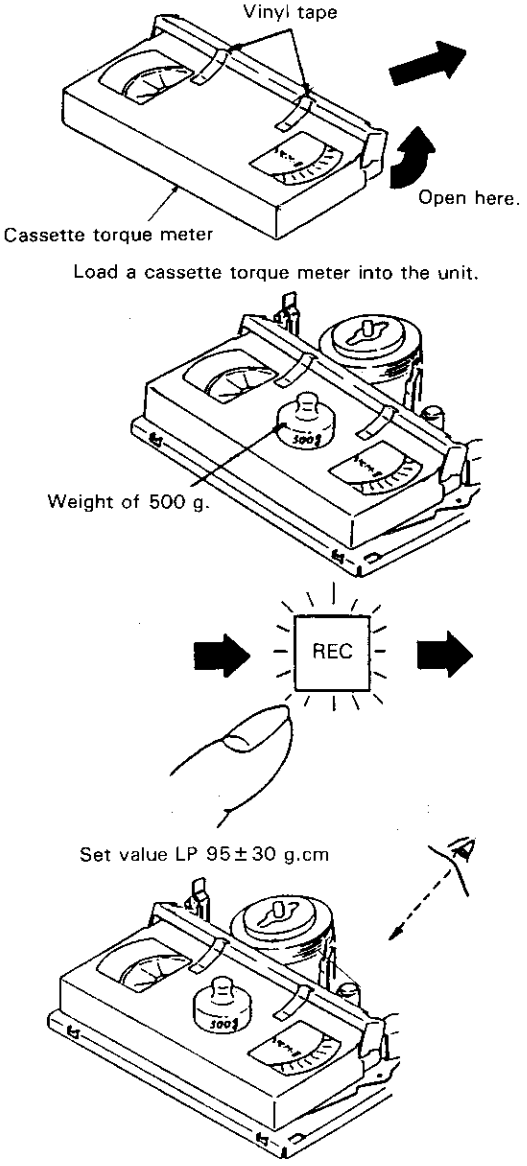



**Figure 1-31.**

- **Checking**

1. Check that the torque is in the range of 95 ± 30 g.cm.
2. The torque fluctuates due to the rotational deviation of the reel drive unit. Use the center of the fluctuation as the value.
3. Place the unit in the LP record mode, and check that the take-up torque is within the range.

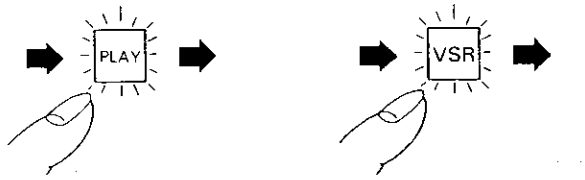
- **Adjustment**

If the take-up torque in the playback mode is outside the range, replace the take-up reel disk.

**Note :** Weight the cassette torque meter to prevent float.

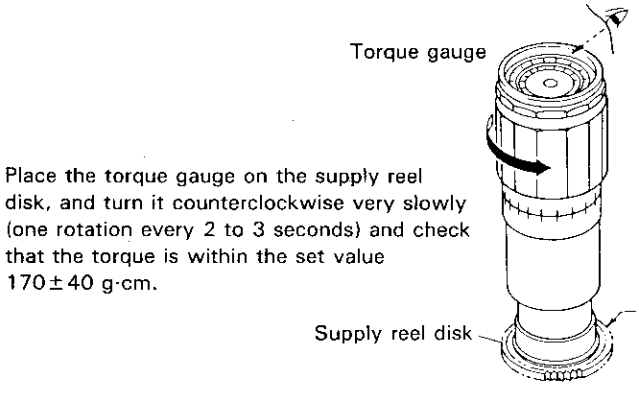
## CHECKING AND ADJUSTMENT OF TAKE-UP TORQUE IN VIDEO SEARCH REWIND MODE

- Remove the cassette housing control assembly.
- **Checking**




Push the play button to place the unit in the playback mode.

Push the video search rewind button to place the unit in the video search rewind mode.




Place the torque gauge on the supply reel disk, and turn it counterclockwise very slowly (one rotation every 2 to 3 seconds) and check that the torque is within the set value 170±40 g·cm.

**Figure 1-32.**

**Note :**
Set the torque gauge securely on the supply reel disk. If the torque gauge is not securely set on the reel disk, measurement will be incorrect.

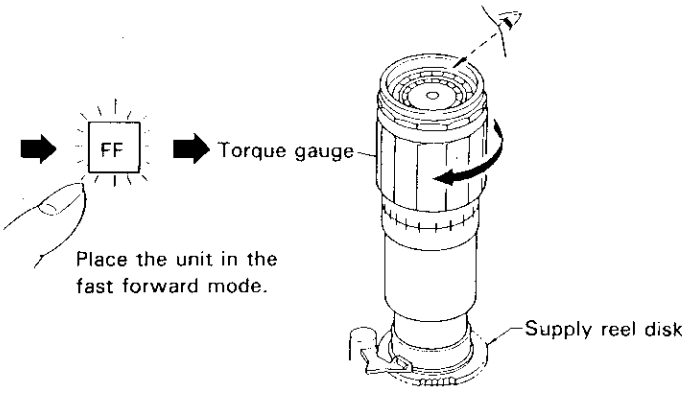
- **Adjustment**

If the take-up torque in video search rewind mode is outside the range, replace the supply reel disk.

**Note :** The torque fluctuates due to the rotational deviation of the supply reel disk. Use the center of the fluctuation at the value.

## CHECKING THE FAST FORWARD BACK TENSION

- Remove the cassette housing control assembly.
- **Checking**



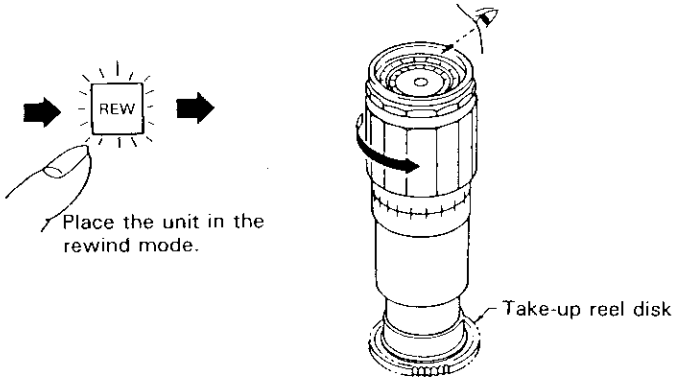

Place the torque gauge on the supply reek disk, and turn it clockwise very slowly (one rotation every 2 to 3 seconds) and check that the torque is within 15±5 g·cm

**Figure 1-33.**

**Note :**
Set the torque gauge securely on the supply reel disk. If the torque gauge is not securely set on the reel disk, measurement will be incorrect.

## CHECKING THE REWIND BACK TENSION

- Remove the cassette housing control assembly.
- **Checking**



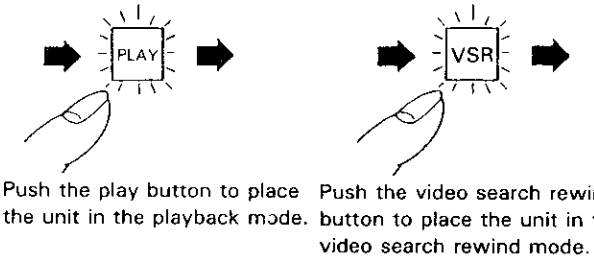

Place the torque gauge on the take-up reel disk, and turn it counterclockwise very slowly (one rotation every 2 to 3 seconds) and check that the torque is within 15±5 g·cm.

**Figure 1-34.**

**Note :**
Set the torque gauge securely on the take-up reel disk. If it is not secure, the measurement will be incorrect.

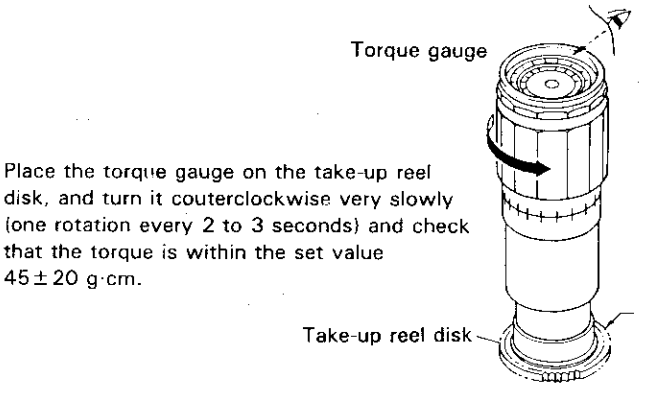
## CHECKING THE VIDEO SEARCH REWIND BACK TENSION

- Remove the cassette housing control assembly.
- **Checking**




Push the play button to place the unit in the playback mode.

Push the video search rewind button to place the unit in the video search rewind mode.




Place the torque gauge on the take-up reel disk, and turn it couterclockwise very slowly (one rotation every 2 to 3 seconds) and check that the torque is within the set value 45±20 g·cm.

**Figure 1-35.**

**Note :**
Set the torque gauge securely on the take-up reel disk. If it is not secure, the measurement will be incorrect.

## CHECKING THE PINCH ROLLER PRESSURE

- Remove the cassette housing control assembly.

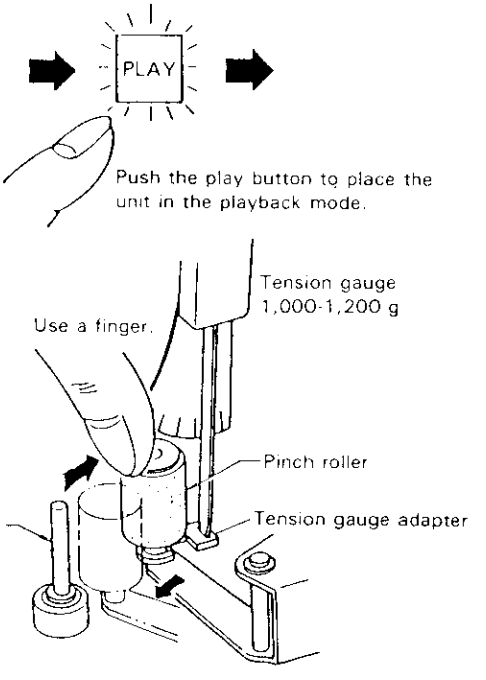


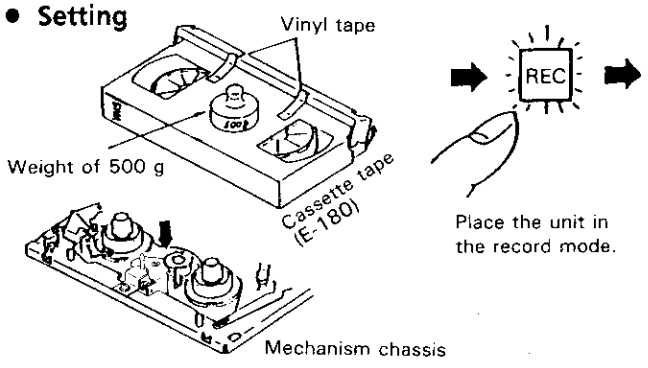

**Figure 1-36.**

1. Detach the pinch roller from the capstan shaft.
2. Set the tension gauge by hooking the tension gauge adapter onto the pinch roller shaft.
3. Gradually release the pressure to allow the pinch roller to touch the capstan shaft. When the pinch roller just touches the capstan shaft, read the indication on the gauge.
4. Check that the reading of the tension gauge is in the range of 1000 to 1200 g.

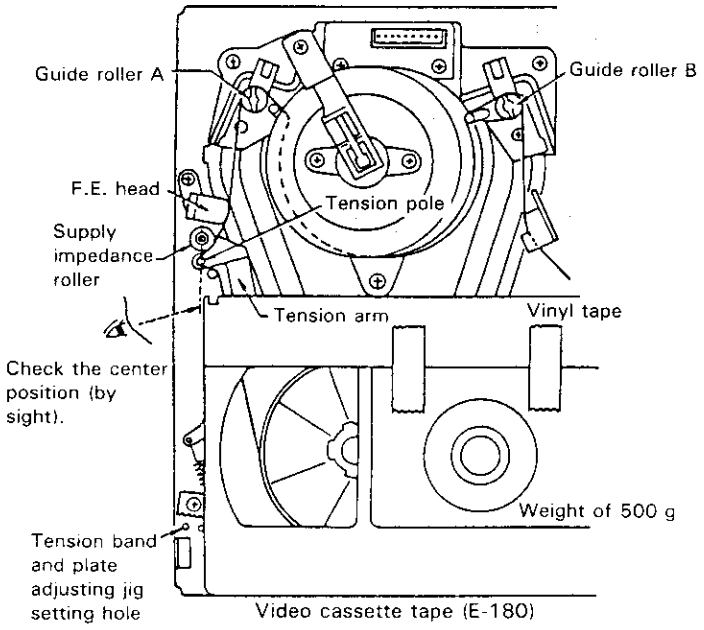
## CHECKING AND ADJUSTMENT OF TENSION POLE POSITION

- Remove the cassette housing control assembly.

- **Setting**




(a)




(b)

**Figure 1-37.**

- **Checking**

1. The guide rollers (A, B) operate to bring the tape outside the cassette tape and simultaneously the tension pole moves to the left, loading the tape. At that time (loading completed), check the position of the tension pole.
2. At the beginning of the tape (E-180), check that the tension pole's center is aligned with the supply impedance roller's center by sight.
3. Check that the end of the tape is neither curled against the flange of the supply impedance roller nor over it.
4. During the video search rewind mode with no cassette tape in place, check that the supply reel disk is free from the tension band.

- **Position adjustment (record mode)**

**When the tension pole is at the right of the supply impedance roller's center:**

Untighten the tightening screw, and shift the tension band adjustment bracket in the direction of the arrow using a tension band and plate adjusting jig until it is in the set value range (center). The secure it with the tightening screw.

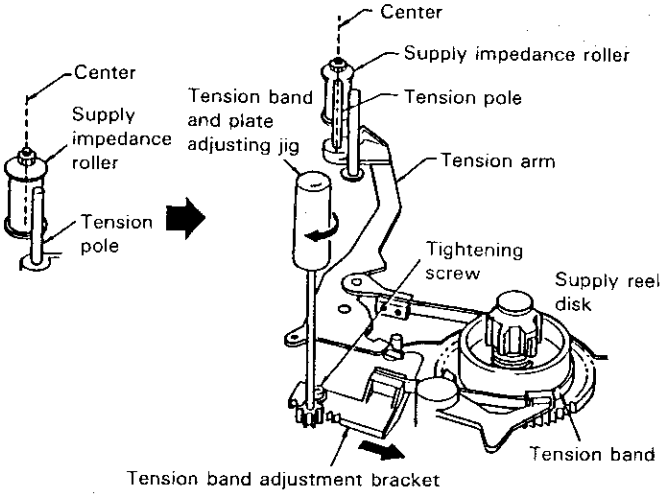



**Figure 1-38.**

- **Position adjustment (record mode)**

**When the tension pole is at the left of the supply impedance roller's center:**

Untighten the tightening screw, and shift the tension band adjustment bracket in the direction of the arrow using a tension band and plate adjusting jig until it is in the set value range (center). The secure it with the tightening screw.

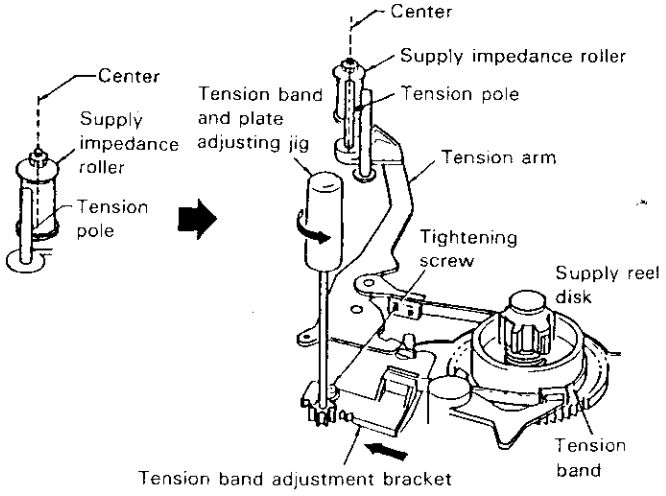



**Figure 1-39.**

## CHECKING AND ADJUSTMENT OF RECORD / PLAYBACK BACK TENSION

- Remove the cassette housing control assembly.
- **Checking**

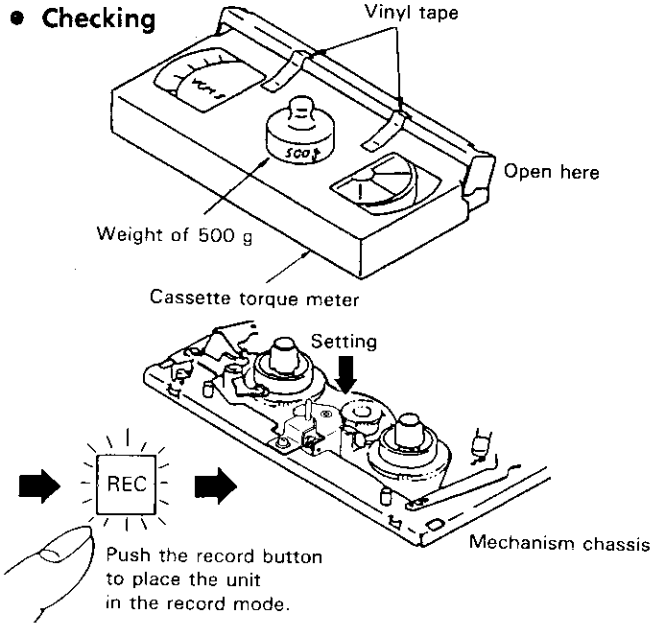



**Figure 1-40.**

1. Put a cassette torque meter into the unit.
2. Push the record button to place the unit in the record mode.
3. Check that the back tension indicated by the gauge is within the set range 23 to 28 g.cm.

**Notes :**

1. Make sure that the video cassette tape is over the retaining guide.
2. Make sure that the tape is not slack nor damaged at either end.

- **Adjustment**

1. If the reading of the cassette torque meter is less than specified, move the tip of the tension spring hook plate toward the hole A.
2. If the reading of the cassette torque meter is more than specified, move the tip of the tension spring hook plate toward the hole B.

* Put a thin screw driver (–) in the shaft hole, lean it toward you, and turn it for easer shift of the tension spring hook plate in the direction of A or B.

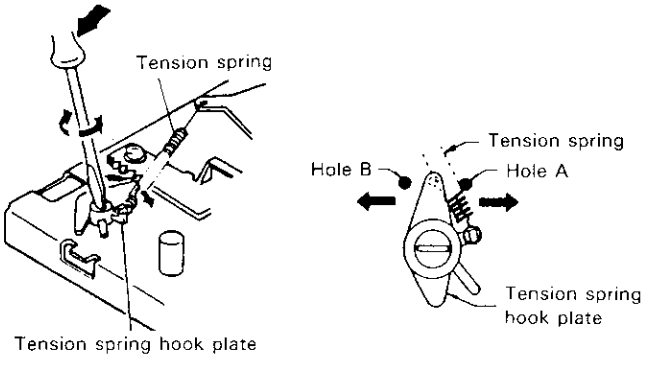



**Figure 1-41.**

**Figure 1-42. Not used.**

## CHECKING THE BRAKE TORQUE

- **Checking the brake torque at the supply side**

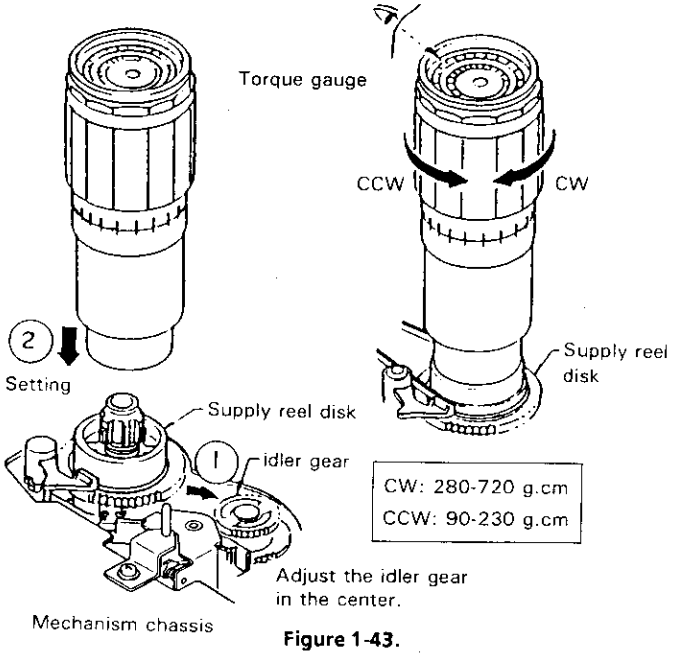



**Figure 1-43.**

1. Remove the cassette housing control assembly.
2. Place the mechanism in the stop mode by unplugging the power cord in the fast forward or rewind mode.
3. Slowly rotate the torque gauge in the clockwise (CW) direction and counterclockwise (CCW) direction of the supply brake so that the reel disk and the indicator of the torque gauge rotate at an equal rate. Check that the values are within the range of CW direction = 280 to 720 g. cm, CCW direction = 90 to 230 g.cm, and that the brake torque in the CW direction is at least twice as high as that in the CCW direction.

- **Checking the brake torque at the take-up side**

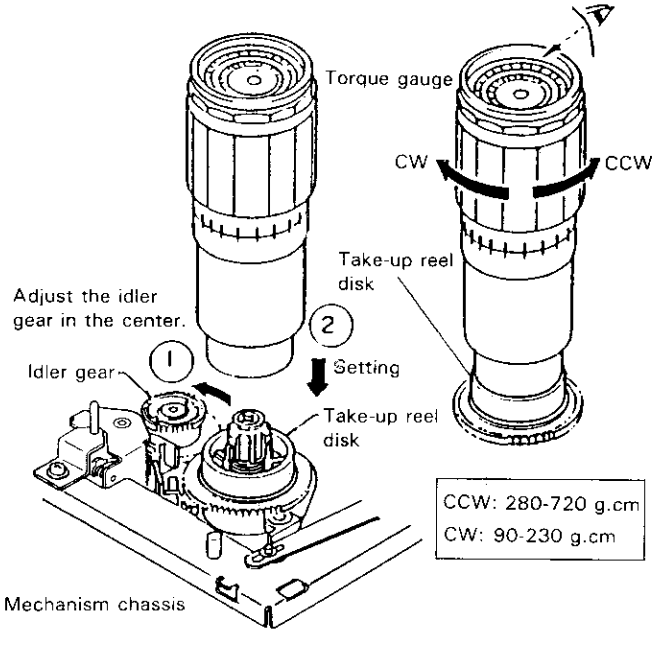



**Figure 1-44.**

1. Remove the cassette housing control assembly.
2. Slowly rotate the torque gauge in the clockwise (CW) direction and counterclockwise (CCW) direction of the take-up brake so that the reel disk and the indicator of the torque gauge rotate at an equal rate. Check that the values are within the range of CCW direction = 280 to 720 g. cm, CW direction = 90 to 230 g.cm, and that the brake torque in the CCW direction is at least twice as high as that in the CW direction.

- **Adjustment of the brake torque at the supply side and the take-up side**

1. If the supply or take-up brake torque is outside the range, clean the supply or take-up reel disk break lever felt, then recheck the torque.
2. If the supply or take-up brake torque is still outside the range, replace the main brake or the main brake spring.

## REPLACEMENT OF MAIN BRAKE

1. Remove the reel belt and the reel block FFC.
2. Remove the cut washer ① off the brake shifter.
3. Unscrew the four screws ② and then the take-up reel retainer.
4. Remove the reel block assembly Ⓐ downward.
5. Remove the cut washer ③ first and then the reel pulley.
6. Unscrew the two screws ④ and detach the idler assembly.
7. Unhook the back tension lever spring ⑤ and remove the back tension lever ⑥. (Undo the hook under the reel chassis.)
8. Open the shifter latch ⑦ and remove the brake shifter assembly ⑧.
9. Release the reel disk catches ⑬ and then remove the left and right reel disk assemblies ⑨ and ⑩.
10. Finally remove the main brake levers ⑪ and main brake spring ⑫.

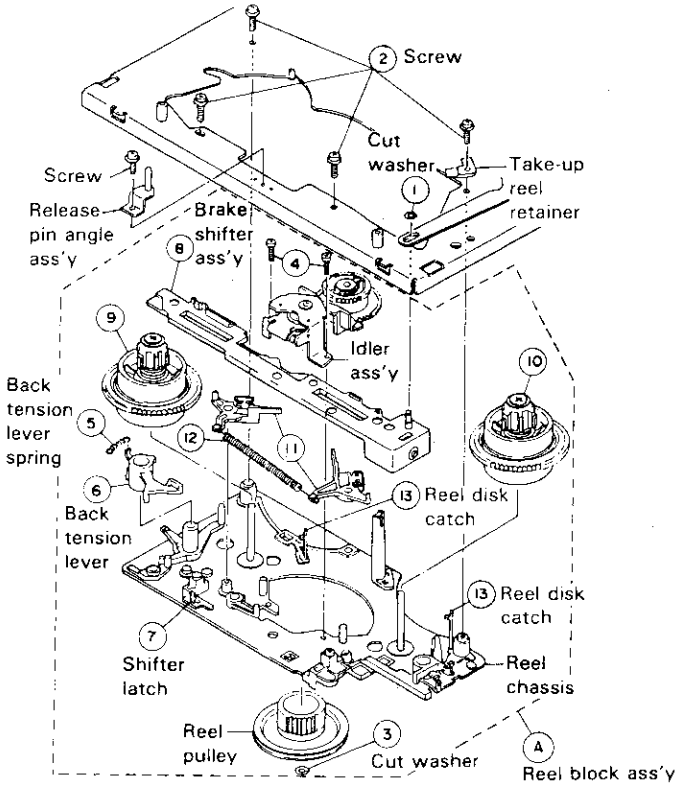



**Figure 1-45.**

**Note :**
When the main brake is replaced, perform the height checking and adjustment (see page 15), and the brake torque checking (see page 20).

## REPLACEMENT OF A/C (Audio/Control) HEAD

1. Remove the cassette housing control assembly.
2. Place the unit in the unloading mode, and unplug the power cord.

- **Removal**

1. Loosen the tilt adjusting screw ①.
2. Remove the azimuth adjusting screw ②.
3. Remove the A/C head screw ③.
4. Unsolder the A/C head PWB soldered to the A/C head assembly.

**Note :**

1. After replacement, be sure to perform the adjustment of the tape drive train (see page 24) and adjustment of the bias current. Under any circumstances, avoid touching the head. Clean the head, if touched with your finger, with alcohol.
2. Take care that the azimuth spring does not fly off when removing the A/C head screw.

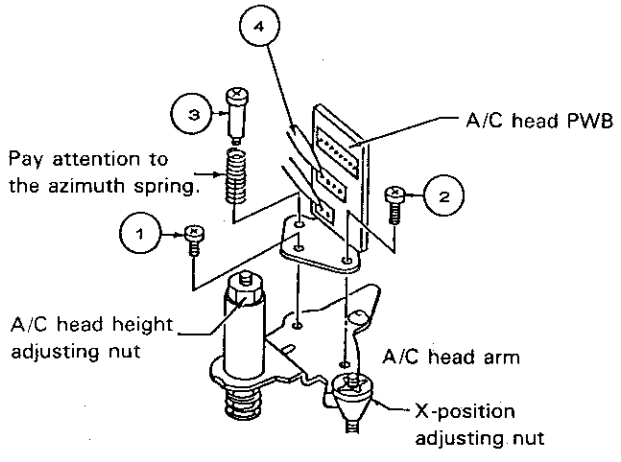



**Figure 1-46.**

- **Replacement**

1. Solder the removed A/C head PWB onto a new A/C head assembly.
2. The A/C head assembly is attached so that the A/C head arm and A/C head plate are roughly parallel to each other.

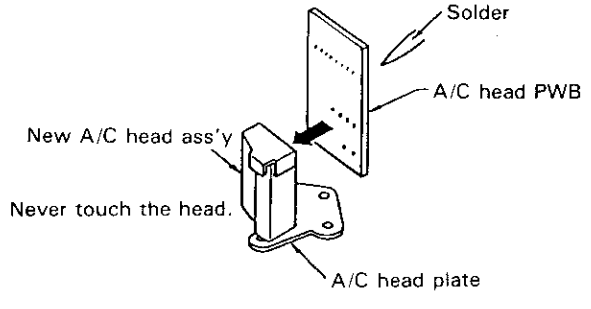



**Figure 1-47.**

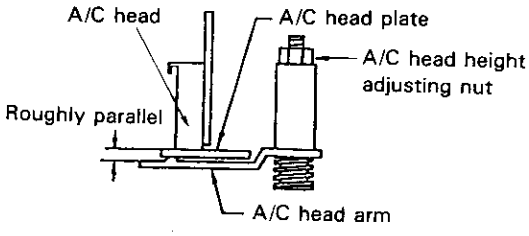
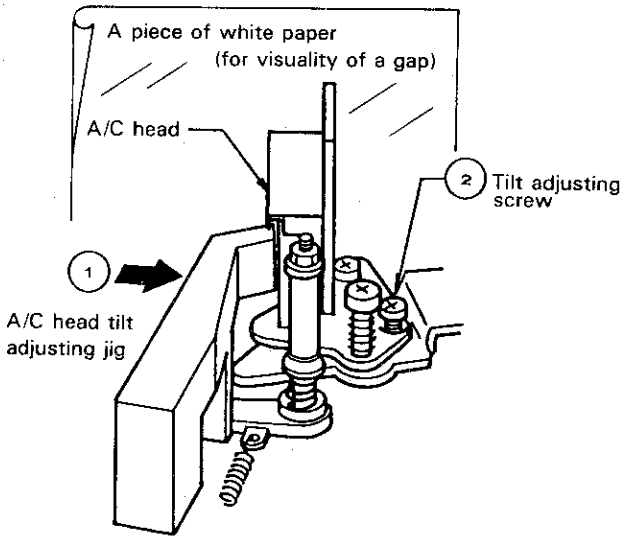



**Figure 1-48.**

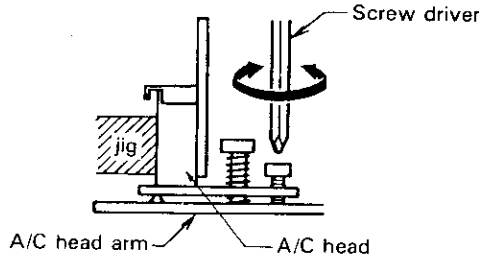
- **Adjustment**

**[A/C head tilt angle]**

1. Set the mechanism to the loading mode.
2. Place the A/C head tilt adjusting jig.
3. Slowly turn the tilt adjusting screw with a screw driver until there is no gap between the jig and the A/C head.



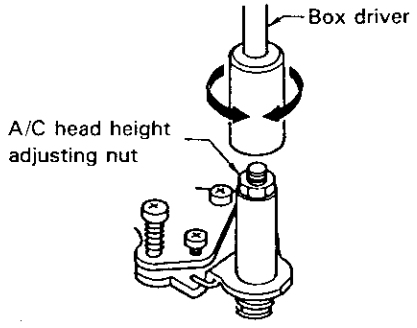

(a)



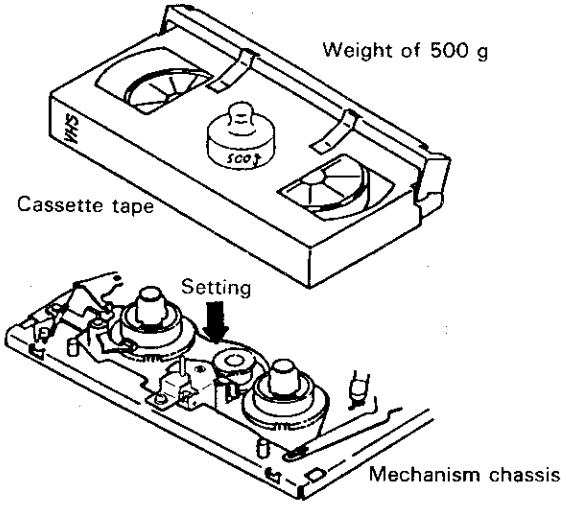

(b)

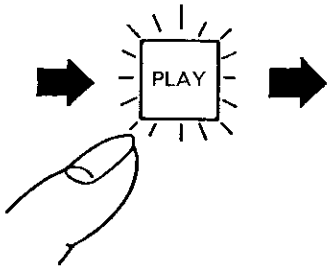
**Figure 1-49.**

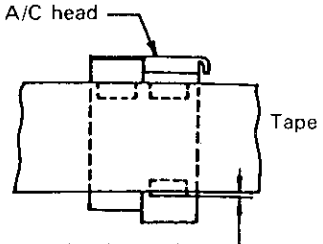
**[A/C head height rough adjustment]**




Roughly adjust the height of the A/C head by turning the A/C head adjusting hexagon nut with the specialized box driver until the tape is in the position shown below.



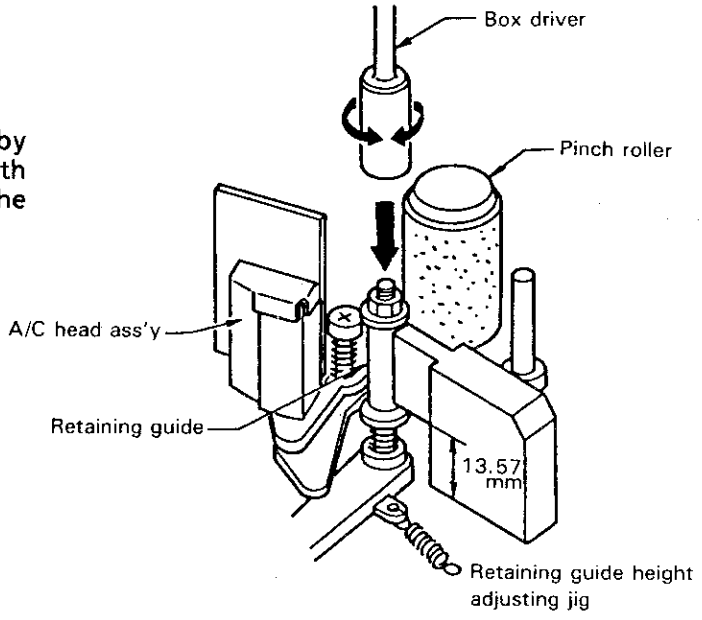

Adjust the nut visually so that the control head is visible 0.3 to 0.5 mm below the bottom of the tape.

**Figure 1-50.**

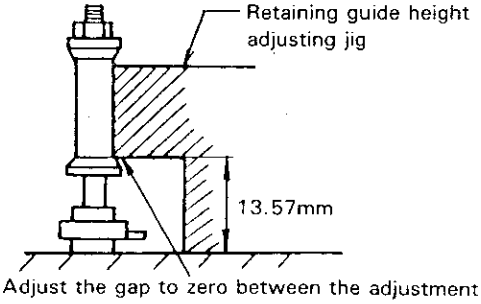
## HEIGHT ADJUSTMENT OF RETAINING GUIDE AND REVERSE GUIDE

**Note :**
Before the rough adjustment of the tape drive train, check that the retaining guide height is within the value in Figure 1-51 by using the special jigs.

**[Height adjustment of retaining guide]**




(a)

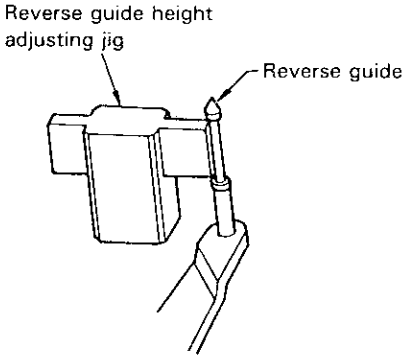



Adjust the gap to zero between the adjustment jig and the lower flange of the retaining guide.

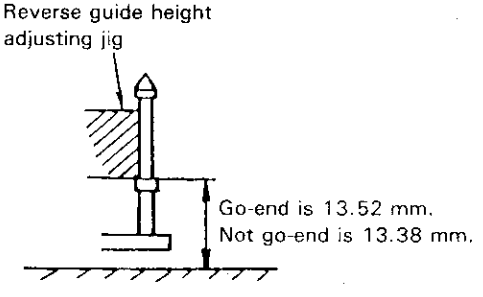
(b)

**Figure 1-51.**

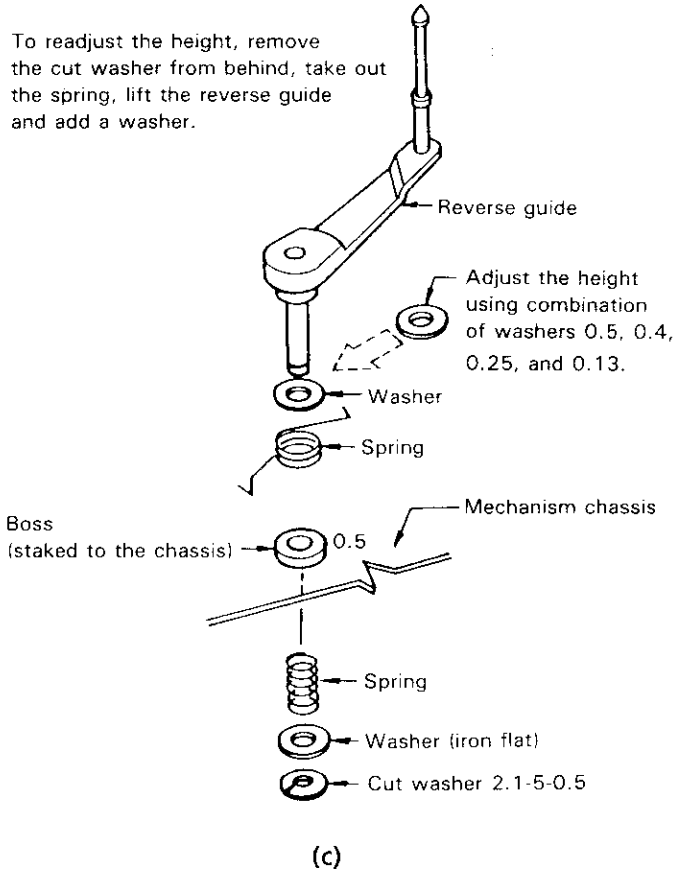
**[Height adjustment of reverse guide]**




(a)




(b)

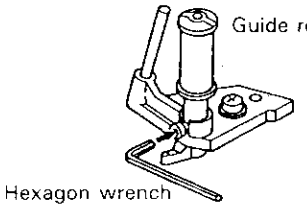

To readjust the height, remove the cut washer from behind, take out the spring, lift the reverse guide and add a washer.
Reverse guide
Adjust the height using combination of washers 0.5, 0.4, 0.25, and 0.13.
Washer
Spring
Boss
(staked to the chassis)
0.5
Mechanism chassis
Spring
Washer (iron flat)
Cut washer 2.1-5-0.5

(c)

**Figure 1-52.**

## ADJUSTMENT OF TAPE DRIVE TRAIN

1. Remove the cassette housing control assembly.
2. Check and adjust the position of the tension pole. (See page 19.)
3. Check and adjust the video search rewind back tension. (See page 18.)
4. Set the tilt angle of the A/C head. (See page 22.)
5. Rough adjustment of tape drive train.
   a) Connect the oscilloscope to the test point for PB CHROMA envelope output (TP301). Set the synchronism of the oscilloscope to EXT. The PB CHROMA signal is to be triggered by the head switching pulse (TP302).
   b) Loosen the setscrew at the lower part of the guide roller, and adjust it with an adjusting screw driver (JIGDRIVERH-4) so that the guide roller turns smoothly. (Do not overloosen the setscrew, which causes insecurity of the guide roller.) (See Figure 1-53.)
   c) Set the alignment tape (VROCPSV) on the reel disk, and place the unit in the playback mode. (Place a 400 to 500 g. weight on the cassette tape to prevent float of the cassette tape.)



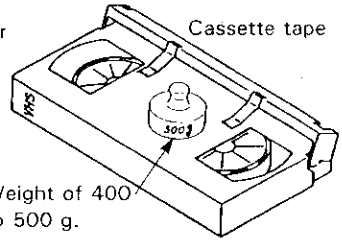
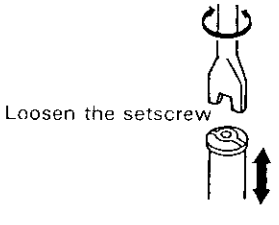




**Figure 1-53.** **Figure 1-54.**

   d) Change the envelope waveform from MAX to MIN, and MIN to MAX by pushing the (▼) or (▲) tracking button, and check a flat response is obtained on the waveform.
   e) If a flat response cannot be obtained, roughly adjust the guide rollers on the supply side and take-up side using an adjusting screw driver until a flat response can be obtained.

**Notes:**

1. Place the tracking control in the center position, and adjust the X-position adjusting nut so that the PB CHROMA envelop becomes maximum for easier rough adjustment of the tape drive train.
2. In the rough adjustment, pay particular attention to the outlet side.



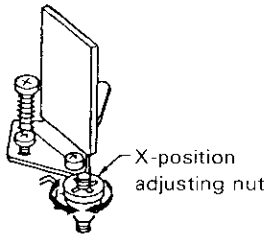




**Figure 1-55.** **Figure 1-56.**

f) Adjust the height of the retaining guide with a box driver for retaining guide adjustment so that the tape is not curled nor wrinkled at the lower and upper flanges of the retaining guide.

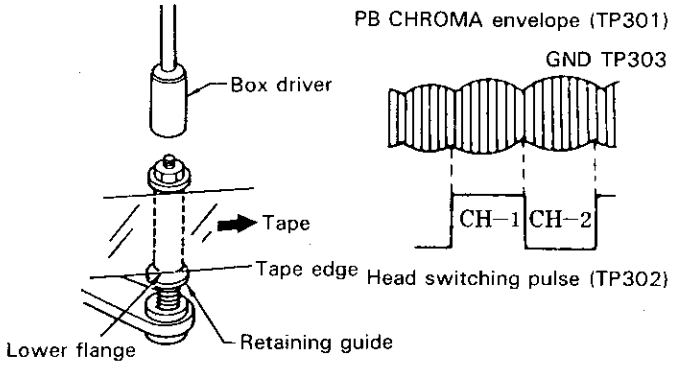



Figure 1-57.




Figure 1-58.

6. Adjustment of A/C head height and azimuth
   a) Connect an oscilloscope to the audio output terminal.
   b) Use the alignment tape and play back its audio 6 kHz signal (monoscope pattern for video signal). Adjust the azimuth adjusting screw to obtain the maximum audio output on an oscilloscope. (See Figure 1-59.)
   c) Use the alignment tape and play back its audio 1 kHz signal (colour bar for video signal) and slowly rotate the A/C head height adjusting nut with the special box driver to obtain the maximum audio output.

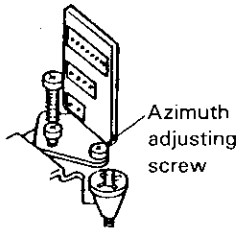



Figure 1-59.

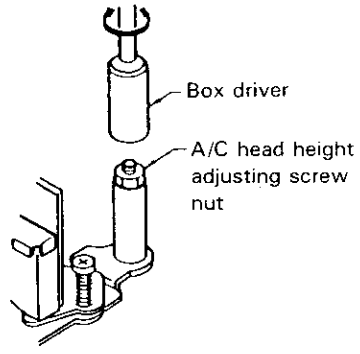



Figure 1-60.

   d) Perform the adjustment in b) again.
   e) After this adjustment, apply glyptal to the screws and nuts to fix them.
7. Adjustment of tape drive train and X-Position.
   a) Connect the oscilloscope to the test points (TP301) for PB CHROMA envelope output. Set the synchronism of the oscilloscope to EXT. The PB CHROMA signal is to be triggered by the head switching pulse (TP302).
   b) Play back the tape drive train alignment tape.
   C) Push the (▼) or (▲) button to change the envelope waveform from MAX to MIN, and MIN to MAX. Adjust the guide roller's height on the supply and take-up sides with an adjusting screw driver, to obtain an envelop waveform that is as flat as possible.
   d) If the tape is above or below the helical lead, the PB CHROMA waveform will take the shape shown in Figure 1-61.
   e) Adjust for maximum flatness of the envelope as the step 5, e) in page 24.

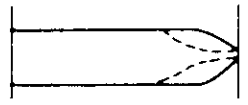
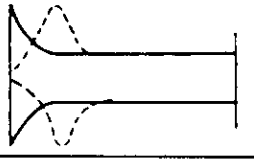
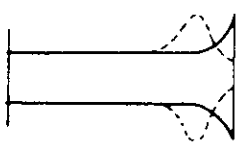
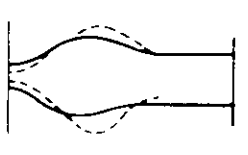
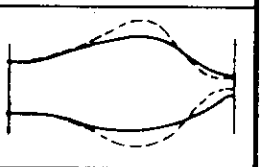
| Tracking button | When the tape is above the helical lead. | | When the tape is below the helical lead. | |
|---|---|---|---|---|
| | Supply side | Take-up side | Supply side | Take-up side |
| ▼ | |  | | |
| ▲ |  |  |  |  |
| Adjustment | | | | |
| Make this adjustment with the(▼) button depressed. | Supply side guide roller rotated in clockwise direction (lowers guide roller) to flatten envelope. (Do not turn the control too much clockwise) | Take-up side guide roller rotated in clockwise direction (lowers guide roller) to lower the tape at the take up side. The take-up side guide roller is then rotated in the counterclockwise direction to flatten the envelope. | Supply side guide roller rotated in counterclockwise direction (raises guide roller) to make the tape float above the helical lead. The supply side guide roller is then rotated in the clockwise direction to flatten the envelope. | Take-up side guide roller rotated in counterclockwise direction (raises guide roller) to flatten envelope. |

Figure 1-61.

f) Secure the guide roller by tightening the guide roller setscrew in the unloading mode.
g) Play back the tape drive train alignment tape to check that the envelope waveform does not change.

8. Adjustment of A/C head X-position.
   a) Push the (▼) and (▲) tracking buttons at the same time to the preset mode.
   b) Rotate the X-position adjusting nut with an adjusting screw driver, and adjust the A/C head position for maximum head switching pulse high side envelope.
   c) Adjust the playback switching point.
   d) Check the flatness of the envelope waveform and sound by playing back a recorded tape.

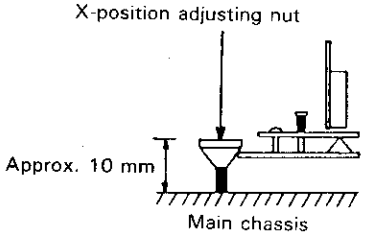



**Figure 1-62.**

## REPLACEMENT OF THE CAPSTAN D.D. (DIRECT DRIVE) MOTOR

- Remove the cassette housing control assembly.
- **Removal (Follow the order of indicated numbers.)**

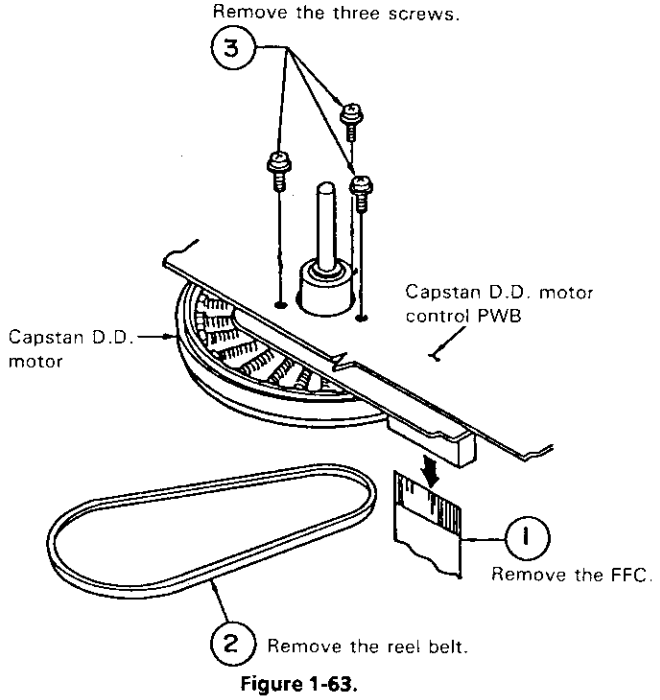



**Figure 1-63.**

- **Reassembly**

1. Mount the capstan motor on the mechanism chassis making sure not to allow the capstan shaft to hit the mechanism chassis, and attach it with the three screws.
2. Insert the FFC into the capstan D.D. motor control PWB.
3. Attach the reel belt.

**Notes :**

1. After installing the capstan D.D. motor, be sure to rotate the copstan D.D. motor and check the morement.
2. Check and adjust the servo circuit.

## REMOVAL AND REASSEMBLY OF THE LOADING GEAR BLOCK

**Notes : The following explanation is based on 4-head models. (The slow brake spring and slow brake lever are not provided on 2-head models.)**

1. Remove the cassette housing control assembly.
2. Remove the reel belt.
3. Remove the reel block.

- **Removal**

**Notes :**

1. Use care not to deform the parts hooked to the slow brake shaft cap, take-up loading gear, and supply loading gear as shown in Figure 1-64.

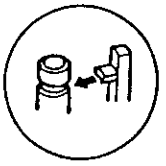


**Figure 1-64.**

2. In removing the loading gear, secure the guide roller with a rubber band or the like beforehand for easier reassembly.

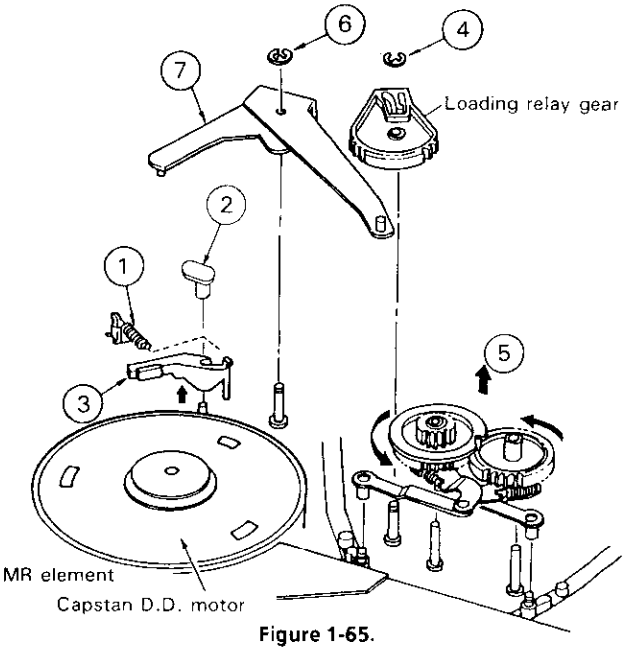



**Figure 1-65.**

1. Remove the slow brake spring ①.
2. Remove the slow brake shaft cap ②.
3. Remove the slow brake lever ③.
4. Remove the E ring ④.
5. Rotate the take-up loading gear, take-up loading arm assembly, supply loading gear and supply loading arm assembly slightly in the loading direction, and take them ⑤ all out.
6. Remove the E ring ⑥.
7. Remove the relay gear drive lever ⑦.

- **Reassembly**

Reverse the procedure. Be sure to match the tally marks on the gears.

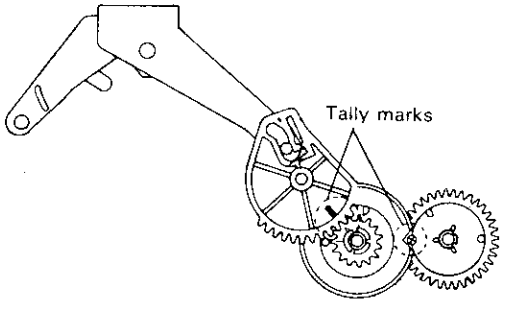



**Figure 1-66.**

**Notes :**

1. When reassembling, apply specified grease to the following points; all the gear teeth, all the gear shafts and the cam groove of loading relay gear.
2. Be careful not the deform the supply/take-up loading arms.
3. Be careful to keep clean the slow brake lever felt.
4. Be also careful to keep the outer surface of the capstan D.D. motor free from dust and dirt. (If stained, the MR (Magnet Resistor) element might be damaged.)
5. Take care not to deform the anti-fall hooks of the slow brake shaft cap and supply/ take-up loading gears more than required.

## REMOVAL AND REASSEMBLY OF LOADING BLOCK

- **Removal**

1. Remove the leads ①.
2. Remove the cassette loading belt ②.
3. Unscrew the three screws ③.
4. Pull the loading block upward.

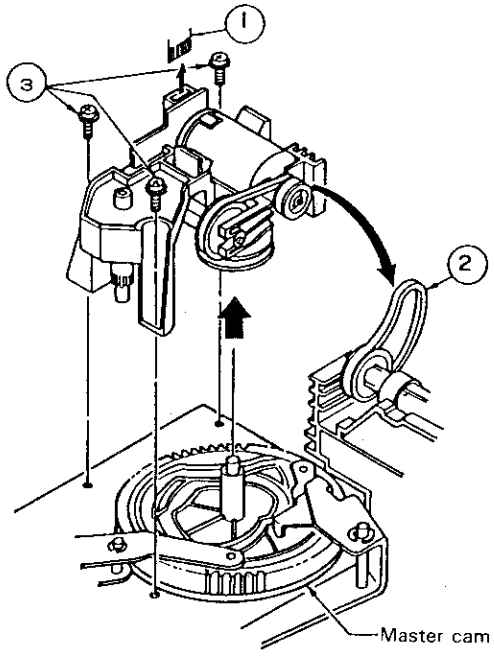



**Figure 1-67.**

**Note :**

When using a magnetic screw driver in removal of three screws, do not allow the magnetic driver to hit the A/C head or drums.

- **Reassembly**

1. Turn the master cam all the way counter-clockwise.
2. Match the tally mark on the cam switch with the mating mark. Fit the loading block and the master cam with each other. Tighten up the three screws.

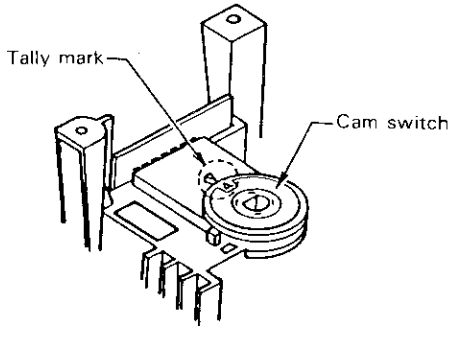



**Figure 1-68.**

3. Finally connect the leads and apply the cassette loading belt.

**Notes:**

1. Be careful not to scratch the gear.
2. Be careful not to stain the belt. If dirty, clean it up with the specified cleaning liquid.

## REPLACEMENT OF LOADING MOTOR

1. Set the cassette ejected condition by placing the unit in the cassette eject mode.
2. Unplug the power cord.
3. Remove the loading block in accordance with the statements and drawings above.

- **Removal**

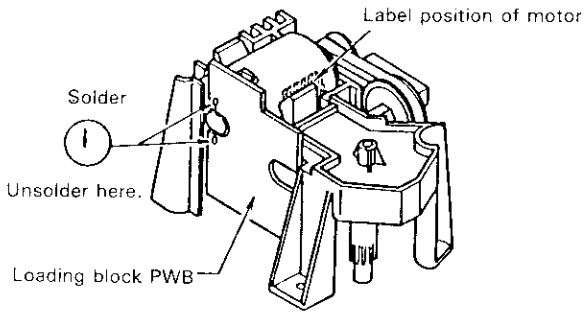



**Figure 1-69.**

1. Unsolder the leads ① from the loading motor.
2. Unlock the left and right catches ② of the cam switch off the loading block. Take out the cam switch and loading block PWB (See Figure 1-70).

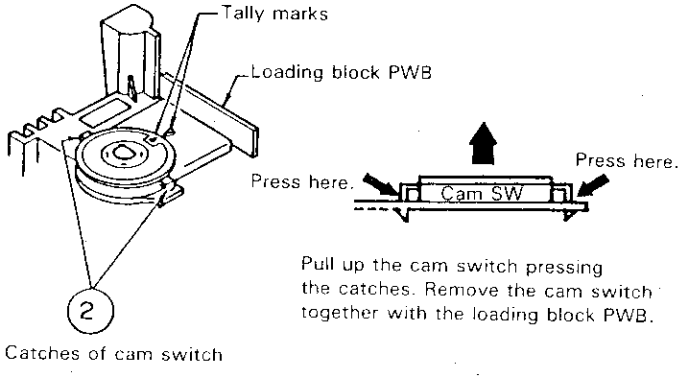

Tally marks
Loading block PWB
Press here.
Press here.
Cam SW
Pull up the cam switch pressing the catches. Remove the cam switch together with the loading block PWB.
Catches of cam switch

**Figure 1-70.**

3. Take out the loading belt ③.
4. Pry up the back end of the loading motor with a screw driver or the like as in Figure 1-71 and take out the motor.

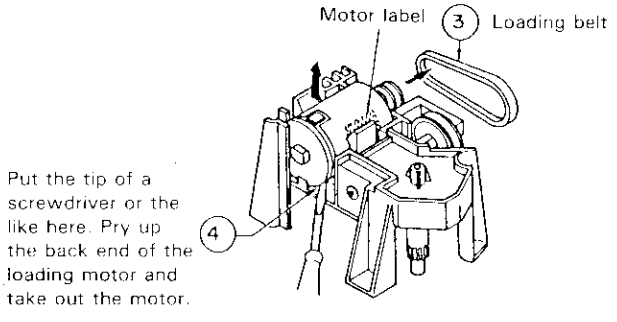

Motor label
Loading belt
Put the tip of a screwdriver or the like here. Pry up the back end of the loading motor and take out the motor.

**Figure 1-71.**

- **Reassembly**

1. Remove the loading motor, and mount a new loading motor as in Figure 1-72.
2. Place the loading motor so that its label is visible as shown in Figure 1-72. Make sure that the screw hole at the motor shaft, protuberance on the loading block, and the motor's back end marked with the arrow are mated with each other.

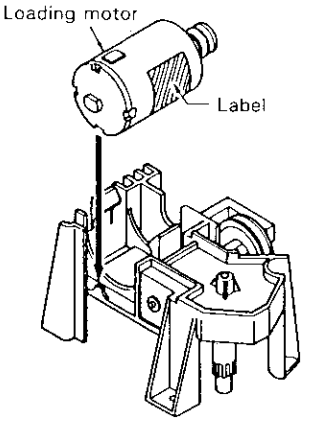
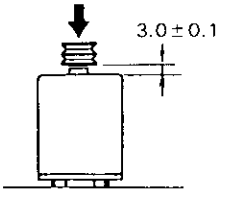



**Figure 1-72.**




**Note:**
When press-fitting the loading motor pulley, keep the pressure less than 5 kg, and the gap between the motor and pulley should be 3.0±0.1 mm.

**Figure 1-73.**

3. Set the lading block PWB and the cam switch in position.
4. Resolder the leads to the loading motor.
5. Finally place the loading block (See page 27).
6. Attach the loading belt.

## REPLACEMENT OF MASTER CAM

- **Removal**

1. Remove the E ring ①.
2. Remove the half-loading drive lever ②.
3. Remove the E ring ③.
4. Remove the pinch roller lever ④.
5. Pull out the master cam upward ⑤.

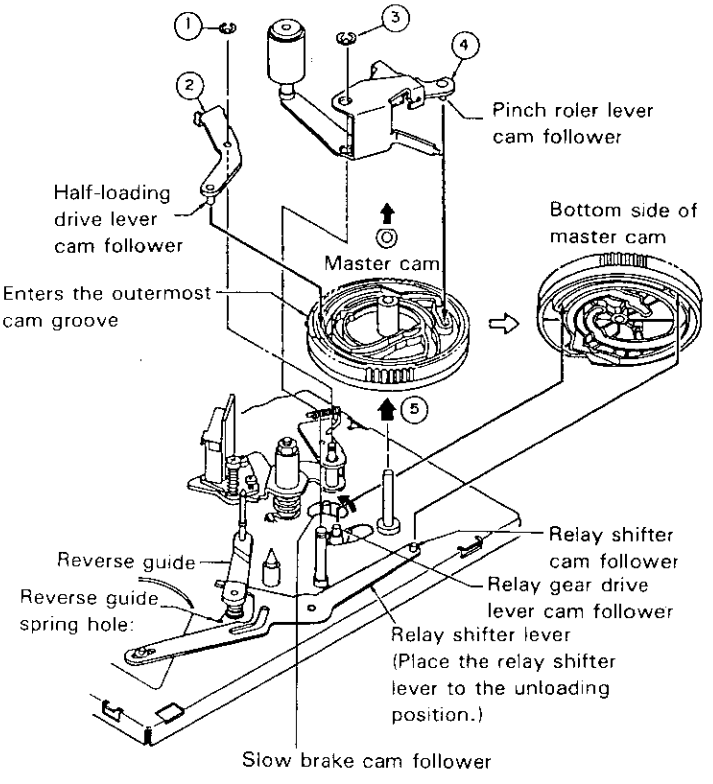

Pinch roler lever cam follower
Half-loading drive lever cam follower
Bottom side of master cam
Master cam
Enters the outermost cam groove
Reverse guide
Reverse guide spring hole
Relay shifter cam follower
Relay gear drive lever cam follower
Relay shifter lever (Place the relay shifter lever to the unloading position.)
Slow brake cam follower

**Figure 1-74.**

- **Reassembly**

1. Place the relay gear drive lever in the unloading state.
2. Place the relay shifter so that it is in contact with the reverse guide spring hole in the mechanism chassis. Release the slow brake lever with a finger to bring it away from the capstan. ( in the direction of arrow). Then place the master cam so that the D cut-off part of the master cam faces the direction of arrow.
3. Place the half- loading reciprocating lever's cam follower so that it fits in the master cam's circumferential cam groove (marked with arrow), attach the E ring, then mount the half-loading reciprocating lever.
4. Turn the master cam somewhat clockwise until the pinch roller lever's cam follower goes into the master cam's groove (marked with arrow), mount the pinch roller lever, then attach the E ring.
5. Rotate the master cam by hand to make sure all the four levers (relay gear drive lever, half-loading reciprocating lever, pinch roller lever, and relay shifter lever) are in the cam grooves in place.
6. Mount the loading block. (See page 27.)

**Notes :**

1. Be careful not to scratch the teeth and grooves of the master cam.
2. After installation of the master cam, be sure to rotate the master cam by hand before installing the loading block. If the levers are in wrong position, the master cam and the levers may get damaged when the motor stares.
3. Apply specified grease to the master cam's grooves and teeth.

## REPLACEMENT OF UPPER DRUM

**Note :**

The gap between the lower drum and the upper drum is very accurate, in the order of microns, and care should be paid to their replacement. Even a slight amount of foreign material will affect the accuracy of their reassembly.

- **Replacement (Follow the order of the indicated numbers.)**

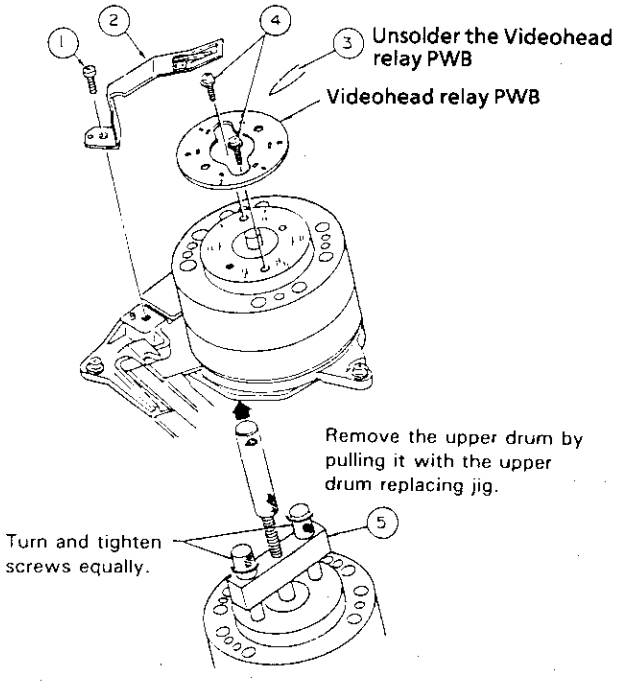



**Figure 1-75.**

**Notes :**

1. Avoid touching the drum surface with bare hands.
2. Pull out the upper drum with care so that it may not be tilted, and replace it with the upper drum replacing jig using care not to damage the disk circumference.
3. Do not hit the screws when tightening them.

- **Reassembly**

**Notes :**

1. Before setting the drum, check that there are no scratches or dust on the edge of the surface and circumference of the disk.
2. Before setting the drum, check that there are no scratches or dust on the internal surface and edge of the surface of the upper drum.
3. On assembling these parts, insert the upper drum onto the disk with care, so that the upper drum is not tilted.
4. When assembling these parts, do not allow dust or dirt come between the disk and the upper drum.
5. Do not use excessive force when driving in the screws.

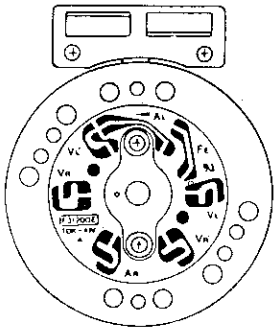


Figure 1-76.

1. Set the new drum.
2. Place the relay PWB as shown in the figure and solder it securely.
3. Fasten the upper drum in place with the two screws.
4. Solder the leads.
   **Note:** Soldering should be performed quickly and carefully without touching adjacent patterns.
5. After replacement, be sure to check the tape drive train adjustment (see page 24.) and the following electric adjustments.

- Adjustment of the playback switching point (For both the videohead and the Hi - Fi audio head ).
- Checking and adjustment of the X-position
- Adjustment of SP and LP slow tracking preset.
- Adjustment of the Hi - Fi playback level.

## REPLACEMENT OF D.D. MOTOR

1. Put the unit in the cassette eject position.
2. Unplug the power cord.

- **Removal (Reverse the order in reassembly.)**

1. Remove the FFC ①.
2. Remove the two D.D. rotor assembly setscrews ②.
3. Pull out the D.D. rotor ③.
4. Remove the three D.D. strator setscrews ④.
5. Remove the D.D. strator assembly ⑤.

**Notes :**

1. When removing the D.D. rotor assembly or D.D. strator assembly, use care not to hit the loading relay gear.
2. Secure the D.D. rotor assembly so that the installation positioning holes in the D.D. rotor assembly and lower drum assembly match.
3. Be careful not to damage the upper drum or the video head.
4. Be sure that the hall device and the D.D. strator assembly are not damaged by the D.D. rotor assembly or other parts.
5. After installation, adjust the playback switching point.

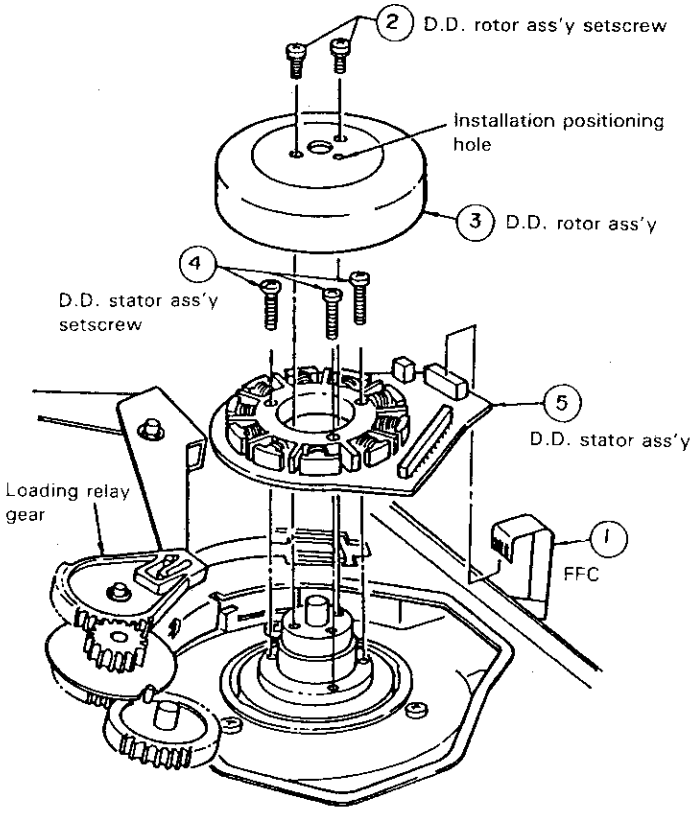



Figure 1-77.

# ADJUSTMENT OF THE ELECTRICAL CIRCUITRY

**Prior to the adjustment:**
In most cases, necessity for electrical circuits will arise from replacement of mechanical parts including the video head. Before starting adjustment of electrical circuits, check that mechanical operation of the equipment is complete (the mechanism are adjusted completely).

If the equipment fails electrically, locate a defect or defects first of all using instruments. Then repair or replace parts and make adjustment by the procedures described below.
When required instruments are not available, do not move controls indiscriminately.

- **Instruments**
  - Colour monitor TV
  - DC regulated power supply
  - VTVM
  - Oscilloscope
  - Audio generator
  - Colour bar generator
  - Alignment tape
  - Frequency counter
  - Blank video tape(VHS)

## ADJUSTMENT OF MAIN ( SYSTEM CONTROL, TUNER)/SERVO CIRCUITS

- **Test points layout**

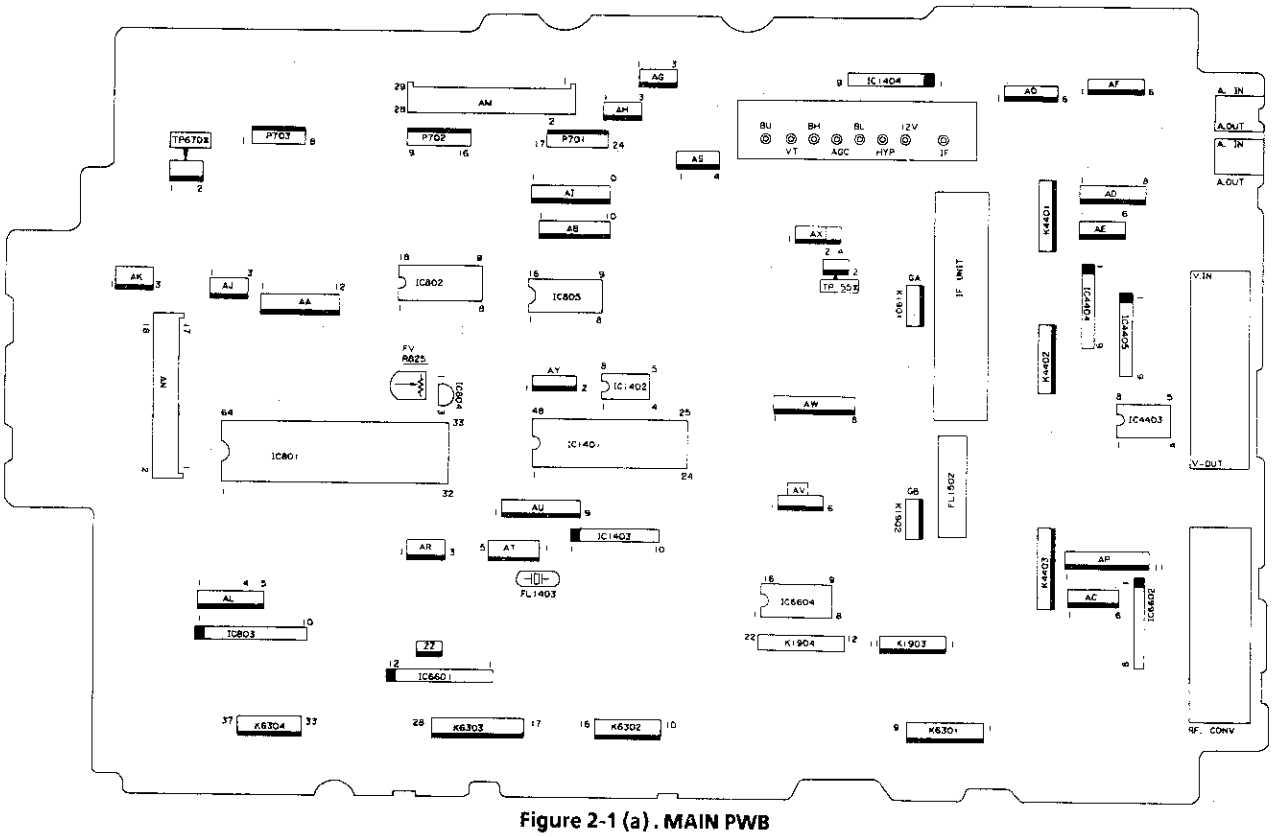


**Figure 2-1 (a) . MAIN PWB**

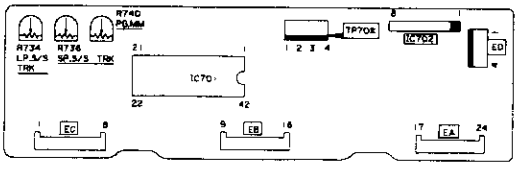


**Figure 2-1 (b). SERVO PWB**

## ■ ADJUSTMENT OF SERVO CIRCUIT

### Adjustment of playback switching point

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback<br>Tracking button at center |
| Tape used | Alignment tape (VROCPSV) |
| Test point | CH-1; TP701<br>CH-2; Video output terminal (CH-1 trigger slope switch at ( + ), Internal trigger at CH-1 side) |
| Adjusting point | R740 (phase generator MM control) |
| Specification | 6.5 ± 0.5H |

1. Insert the alignment tape (VROCPSV) and put the unit in playback mode.
2. Set the tracking button to the center position.
3. Adjust R740 (phase generator MM control) so that the waveform on the oscilloscope screen be as shown in Figure 2-2.

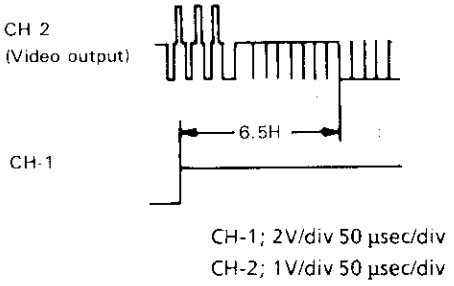



**Figure. 2-2.**

### Adjustment of SP slow tracking preset

| | |
|---|---|
| Measuring instrument | Monitor TV |
| Mode | Record time switch at SP position. Recording and playback on self-recording tape. |
| Input signal | Commercial broadcast or video signal (external input selector switch) |
| Test Point | Monitor screen |
| Adjusting point | R736 (SP slow tracking control) |
| Specification | No noise bar on the monitor TV screen. |

1. Receive a commercial broadcast signal, or feed the video signal to the video input terminal (with the external input selector switch).
2. Set the record time switch to the SP position. Make recording and playback on the self-recording tape.
3. Press the slow button and play back the recorded portion in the slow mode.
4. Set the SP slow tracking control to the center click position.
5. Observing the monitor screen, adjust R736 (SP slow tracking preset control) until the noise bar disappears form the screen.
6. Press the playback button to play back the tape. Then push the pause/still button to reproduce the recording in the still mode. Now make sure there is no noise on the screen. (Repeat this step three times or so.)

### Adjustment of LP slow tracking preset

| | |
|---|---|
| Measuring instrument | Monitor TV |
| Mode | Record time switch at LP position. Recording and playback on self-recording tape. |
| Input signal | Commercial broadcast or video signal (external input selector switch) |
| Test point | Monitor screen |
| Adjusting point | R734 (LP slow tracking control) |
| Specification | No noise bar on the monitor TV screen |

1. Receive a commercial broadcast signal, or feed the video signal to the video input terminal (with the external input selector switch).
2. Set the record time switch to the LP position. Make recording and playback on the self-recording tape.
3. Press the slow button and play back the recorded portion in the slow mode.
4. Set the LP slow tracking control to the center click position.
5. Observing the monitor screen, adjust R734 (LP slow tracking preset control) until the noise bar disappears from the screen.
6. Press the playback button to play back the tape. Then push the pause/still button to reproduce the recording in the still mode. Now make sure there is no noise on the screen. (Repeat this step three times or so.)

### Adjustment of still picture vertical sync (FV)

| | |
|---|---|
| Measuring instrument | Monitor TV |
| Mode | Still picture playback |
| Tape used | Self-recording tape |
| Test point | Monitor screen |
| Adjusting point | R825 (still picture vertical sync control) |
| Specification | No vertical jitter |

1. Play back the tape self-recorded in the SP mode.
2. Press the pause/still button to reproduce the recording in the still mode.
3. Observing the monitor screen, adjust R825 (still picture vertical sync control) until the vertical jitter disappears form the screen.
4. Then play the tape self-recorded in the LP mode and make sure there is no vertical jitter on the monitor screen.

### Precaution in adjusting the X-position

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback |
| Tape used | Alignment tape (VROCPSV) |
| Test point | CH1: TP701 (Head Switching Pulse)<br>CH2: TP702 (Playback Control)<br>(CH1 OscilloscopeTrigger S) |
| Adjusting point | ———— |
| Specification | T = 30.58msec. |

1. Insert the alignment tape (VROCPSV) and put the unit in the playback mode..
2. Set the tracking button to the center position.
3. Make sure that the waveform on the oscilloscope screen be as shown in Figure 2-3.

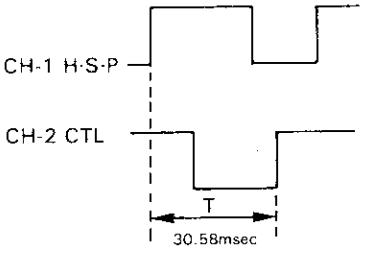



Figure. 2-3

## ■ ADJUSTMENT OF ON-SCREEN DISPLAY

### Adjustment of AFC

| | |
|---|---|
| Measuring instrument | Frequency counter |
| Mode | ———— |
| Input signal | ———— |
| Test point | TP03 |
| Adjusting point | VR01 (AFC control) |
| Specification | 15.625 ± 0.25 kHz |

1. Switch on the unit. Press the on-screen display button on the infrared remote control to give the counter display on the monitor TV screen.
2. Apply + 5V signal to Pin ② of IC01 via a 1-kohm resistor.
3. Using the frequency counter, measure the signal being introduced from TP03.
4. Adjust VR01 (AFC adj.) so that the counter reading be 15.625 kHz.
5. Disconnect the 1-kohm resistor (See step 2 above).
6. Make sure there is no jitter and distortion with the characters on the screen.

### Adjustment of dot clock

| | |
|---|---|
| Measuring instrument | Oscilloscope, monitor TV |
| Mode | ———— |
| Input signal | ———— |
| Test point | Video output terminal<br>Monitor screen |
| Adjusting point | C02 |
| Specification | 55.2 ± 1 µsec |

1. In the AFC checking discussed above, check to see if the right-hand margin of the counter display on the monitor TV screen is as specified.
2. Observe the video output terminal waveform on the oscilloscope. Make sure that takes 55.2 ± 1 µsec. between the leading edge of the H sync pulse and the final character display on the screen.

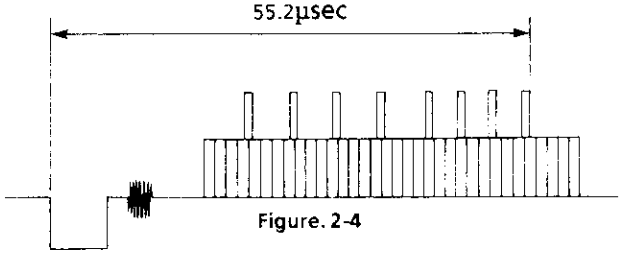
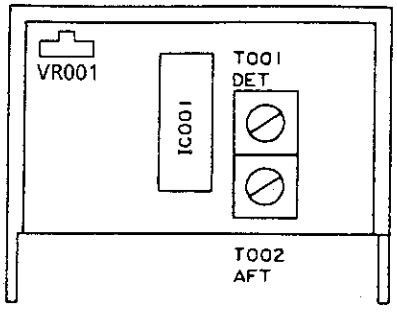



Figure. 2-4

## Adjustment of AFT

| Measuring instrument | Oscilloscope<br>Signal generator |
|---|---|
| Mode | EE |
| Input signal | PIF frequency uniwave<br>(39.5 MHz ± 1 kHz)<br>Colour bar signal (70 dBμ) |
| Test point | Video output terminal |
| Adjusting point | T002 (AFT coil) |
| Specification | ———— |

1. Receive the colour bar signal (input field strength: 70 dBμ).
2. First set the band selector switch to UHF position. Using the signal generator, feed the 39.5-MHz PIF frequency signal (sine wave) to the tuner IF output terminal.
   Use the (−) and (+) keys so that the video output terminal waveform be minimum.
3. Set the band selector switch normal position.
4. Using the signal generator, feed the 39.5-MHz ± 1 kHz PIF frequency signal (sine wave) to the tuner IF output terminal.
   (Adjust the attenuator to attenuate the input signal down to an appropriate level).
5. Adjust T002 (AFT coil) in the IF pack so that the video output terminal waveform be minimum.




## Adjustment of RF AGC

| Measuring instrument | Oscilloscope |
|---|---|
| Mode | ———— |
| Input signal | Colour bar signal |
| Test point | Video output terminal |
| Adjusting point | T001 (RF AGC) |
| Specification | ———— |

1. Receive the colour bar signal (input field strength: 80 dBμ).
2. Observe the video output terminal waveform on the oscilloscope. Adjust VR001 (RF AGC) in the IF pack until the noise disappears from the oscilloscope screen and the waveform nearly comes into sync.

Figure. 2-5.

## Adjustment of SIF detection coil

| Measuring instrument | Sweep generator<br>Oscilloscope<br>Maker generator |
|---|---|
| Mode | ———— |
| Input signal | Pin ⑯ of IC1901 |
| Test point | Pin ⑪ of IC1901 |
| Adjusting point | T1901 (SIF detection coil) |
| Specification | Adjust the peak point at 39.5 MHz. |

1. Apply AGC voltage (5V or less) to pin ⑤ of IC1901.
2. Connect the sweep lead to pin ⑯ of IC1901. (Connect the junction of C1905 and FL1901 to GND.)
3. Connect the response lead to pin ⑪ of IC1901.
4. Adjust T1901 to align the peak as shown in Fig. 2-6.

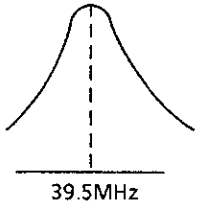



Figure. 2-6.

## ■ ADJUSTMENT OF Hi-Fi/LINER AUDIO CIRCUIT

- **Test Point Layout**

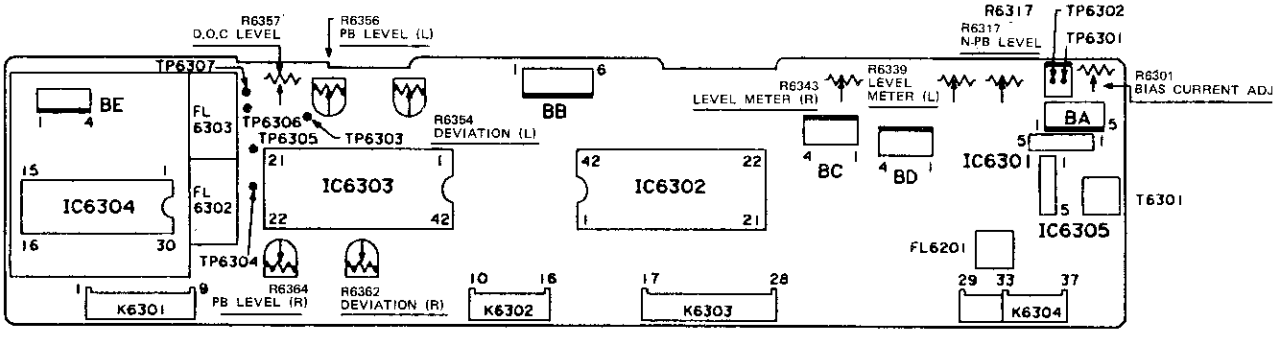



**Figure. 2-7. HiFi PWB**

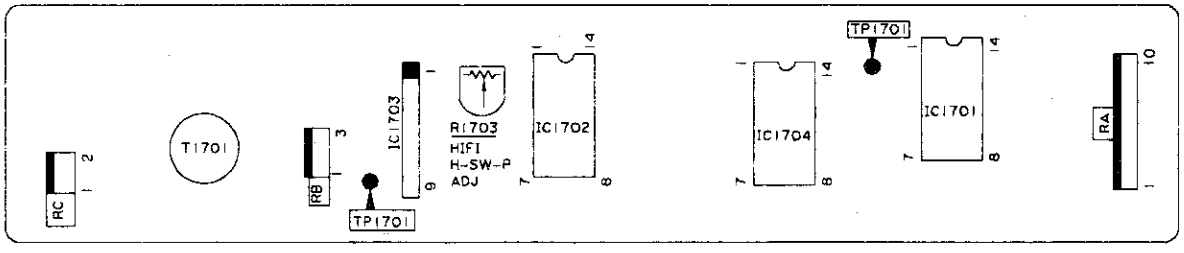



**Figure. 2-8. ROTARY ERASE PWB**

**(The items in brackets [ ] refer to R-CH parts.)**
**Adjustment of EE level**

| | |
|---|---|
| Measuring instrument | VTVM |
| Mode | EE |
| Input signal | – 5dBs, 1kHz |
| Test point | Audio output terminal |
| Adjusting point | R8104 [R8105] |
| Specification | – 5dBs |

1. Turn the input selector switch to "AUX".
2. Input – 5dBs, 1kHz signal to audio input terminal.
3. Set the recording level control to the center click position.
4. Connect CH-1 of an VTVM to the left of the audio output terminal, CH-2 to the right of the audio output terminal and adjust R8104 [R8105] so that the reading of the VTVM becomes – 5dBs, 1kHz.

**Note:**
Both R8104 and R8105 are located on the opration unit.Adjustment of deviation

**Adjustment of deviation**

**(Adjustment by using a spectrum-analyser)**

| | |
|---|---|
| Measuring instrument | Spectrum-analyser |
| Mode | EE |
| Input signal | – 5dBs, 1kHz |
| Test point | TP6306 [TP6305]<br>TP6307 (GND) |
| Adjusting point | R6354 [R6362] (deviation control) |
| Specification | 50 ± 5kHz |

1. Feed – 5dBs, 1kHz signal to the audio input terminal.
2. Observe TP6306 [TP6305] (Hi-Fi unit) and TP6307 (GND) signals by the spectrum-analyser, and adjust R6354 [R6362] so that the spectrum-analyser reads 50 ± 5kHz . (as shown in Fig. 2-9)

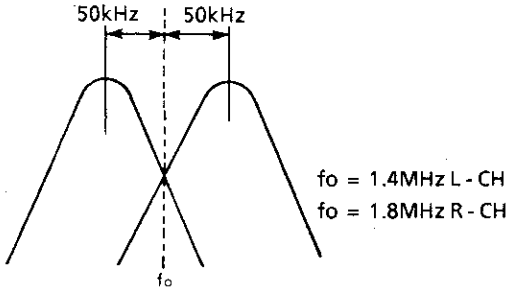



Figure. 2-9.

**(Adjustment by using a frequency counter and an VTVM)**

| Measuring instrument | Frequency counter, VTVM |
|---|---|
| Mode | Recording / Playback |
| Tape used | Hi-Fi alignment tape (VROCBFFS) |
| Input signal | – 5dBs, 1kHz |
| Test point | TP6306 [TP6305] TP6307 (GND) |
| Adjusting point | R6354 [R6362] |
| Specification | – 5 ± 1dBs |

1. Play back the Hi-Fi alignment tape (VROCBFFS) and check that the playback level is – 5 ± 1 dBs.
2. Check the carrier frequency: connect a frequency counter to TP6306 [TP6305] and TP6307 (GND) check that the reading is 1.4 MHz ± 10kHz [1.8 MHz ± 10kHz].
3. Input – 5dBs, 1kHz signal to the audio line input terminal.
4. Set the recording level control to the center click position.
5. Record the signal and play it back. If the playback level is less than – 5 ± 1dBs, turn R6354 [R6362] clockwise; if more than – 5 ± 1dBs, turn it counterclockwise. Record the signal and play it back again.
6. Repeat Step 5 until you obtain a reading of – 5 dBs ± 1dBs.

**Adjustment of drop out level**

| Measuring instrument | VTVM |
|---|---|
| Mode | Playback |
| Input signal | ——— |
| Test point | TP6303, TP6307 (GND) |
| Adjusting point | R6357 (drop out level control) |
| Specification | 3.8 ± 0.1V |

1. Put the set in playback mode.
2. Connect an VTVM to TP6303 and TP6307, and adjust R6357 (drop out level) so that output available on the oscilloscope is 3.8V ± 0.1V.

**Adjustment of HiFi head switching pulse**

| Measuring instrument | Oscilloscope |
|---|---|
| Mode | Playback mode |
| Cassette tape | HiFi standard tape (VROCBFFS) |
| Test point | External trigger TP901, CH-1 TP6305, CH-2 TP6304 |
| Adjusting point | R1703 (HiFi H-SW-P adjustment) |
| Specification | 50 ± 70 µsec |

- R1703 is located on the rotary erase board.
- TP6304 and TP6305 are located in the HiFi module.

1. Play back the HiFi standard tape (VROCBFFS).
2. Connect the external trigger lead of the oscilloscope to TP701 and set it to derating.
3. Turn HiFi head switching pulse adjustment potentiometer R1703 fully counterclockwise to obtain the waveform as shown in Figure 2-10(a).
4. Turn R1703 clockwise to obtain the waveform as shown in Figure 2-10 (b).
5. Adjust R1703 so that the trailing edge of the head switching pulse aligns at 50 µsec to the left of the middle position between point A in Figure 2-10(a) and point B in Figure 2-10(b).
6. Set the oscilloscope to TRIG slope ( – ) and make sure the envelope is not interrupted.

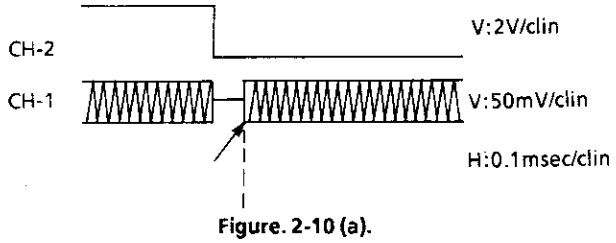



Figure. 2-10 (a).

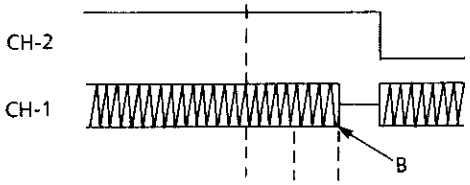



Figure. 2-10 (b).

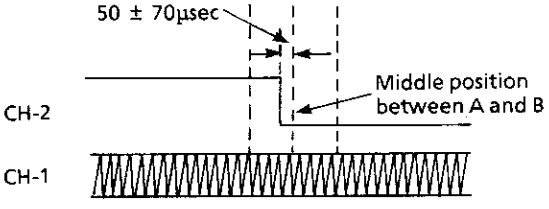



Figure. 2-10 (c).

### Adjustment of Hi-Fi playback level

| | |
|---|---|
| Measuring instrument | VTVM |
| Mode | Playback |
| Tape used | Hi-Fi alignment tape (VROCBFFS) |
| Input signal | ———— |
| Test point | Audio line output terminal (L, R) |
| Adjusting point | R6356 [R6364] (playback level control) |
| Specification | – 5dBs ± 1dBs |

1. Playback the Hi-Fi alignment tape.
2. Connect CH-1 of an VTVM at the audio line output terminal (L), CH-2 of an VTVM at the audio output terminal (R) and then set the audio output select to Hi-Fi and stereo.
3. Adjust R6356 [R6364] to the point at which the playback level is – 5dBs ± 1dBs.

### Adjustment of level meter

| | |
|---|---|
| Measuring instrument | Level meter |
| Mode | EE |
| Input signal | – 5dBs, 1kHz |
| Test point | Level meter |
| Adjusting point | R6339 [R6343] |
| Specification | 0dB Lights |

1. Input – 5dBs, 1kHz audio oscillator signal to the audio line input terminal.
2. Set the audio input switch to external.
3. Audio output switch should be set to stereo, and the record control (L and R) set to the center click position.
4. Adjust R6339 [R6343] so that the level meter lights as for as the 0 dB point.
5. Then, receive a monaural signal, and adjust R6343 so that the input levels of both L-CH and R-CH become the same.

### Adjustment of playback level

| | |
|---|---|
| Measuring instrument | VTVM |
| Mode | Playback |
| Input signal | Alignment tape (VROCPSV) (1-kHz level control signal) |
| Test point | Audio output terminal |
| Adjusting point | R6317 (playback level control) |
| Specification | – 9 ± 1dBs |

1. Play back the alignement tape (1-kHz level control signal).
2. Hook up the VTVM to the audio output terminal.
3. Adjust R6317 (playback level control) so that the output level be – 9 ± 1dBs.

### Checking of erase voltage and oscillation frequency

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Recording |
| Input signal | ———— |
| Test point | Both ends of the full-erase head |
| Adjusting point | ———— |
| Specification | Erase voltage; Over 40 Vp-p<br>Oscillation frequency;<br>70 ± 7kHz |

1. Place the unit to the record mode.
2. Hook up the oscilloscope to both ends of the full-erase head.
3. Make sure the erase voltage is over 40 Vp-p.
4. Be sure that the oscillation frequency is 70 ± 7kHz.

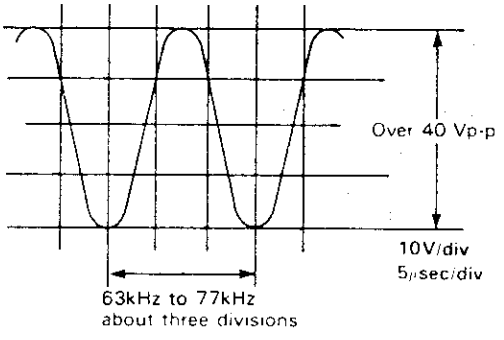



**Figure. 2-11.**

### Adjustment of bias current

| | |
|---|---|
| Measuring instrument | VTVM |
| Mode | Recording (SP) |
| Input signal | ———— |
| Test point | TP6301 (SIG), TP6302 (GND) |
| Adjusting point | R6301 (bias current control) |
| Specification | 270 ± 5μA (270 ± 5mV) |

1. Connect the VTVM TO TP601 (SIG) and TP602 (GND) on the main unit.
2. Place the unit to the record mode.
3. Adjust R6301 (bias current control) so that the bias current be 270 ± 5μA (270 ± 5mV).

### Checking of bias leak

| | |
|---|---|
| Measuring instrument | VTVM |
| Mode | Recording |
| Input signal | ———— |
| Test point | Audio output terminal |
| Adjusting point | ———— |
| Specification | Less than – 20 dBm |

1. Place the unit to the record mode.
2. Connect the VTVM to the audio output terminal.
3. Make sure the bias leak is below – 20dBm.

### Checking of recording/playback levels

| | |
|---|---|
| Measuring instrument | VTVM |
| Mode | Self-recording/playback |
| Input signal | – 5dBs, 1kHz |
| Test point | Audio output terminal |
| Adjusting point | ———— |
| Specification | – 5 ± 3 dBs |

1. Feed 1kHz, – 5dBs signal to the audio input terminal. Make self-recording and playback of the signal.
   **Note:**
   For Hi-Fi recording, feed the signal to the left and right channels at the same time.
2. Make sure the output at the audio output terminals is – 5 ± 3dBs for playback mode.
3. If out of spec, readjust the erase voltage, oscillation Frequency and the bias current.

## ■ ADJUSTMENT OF Y/C CIRCUIT

- **Test point layout**

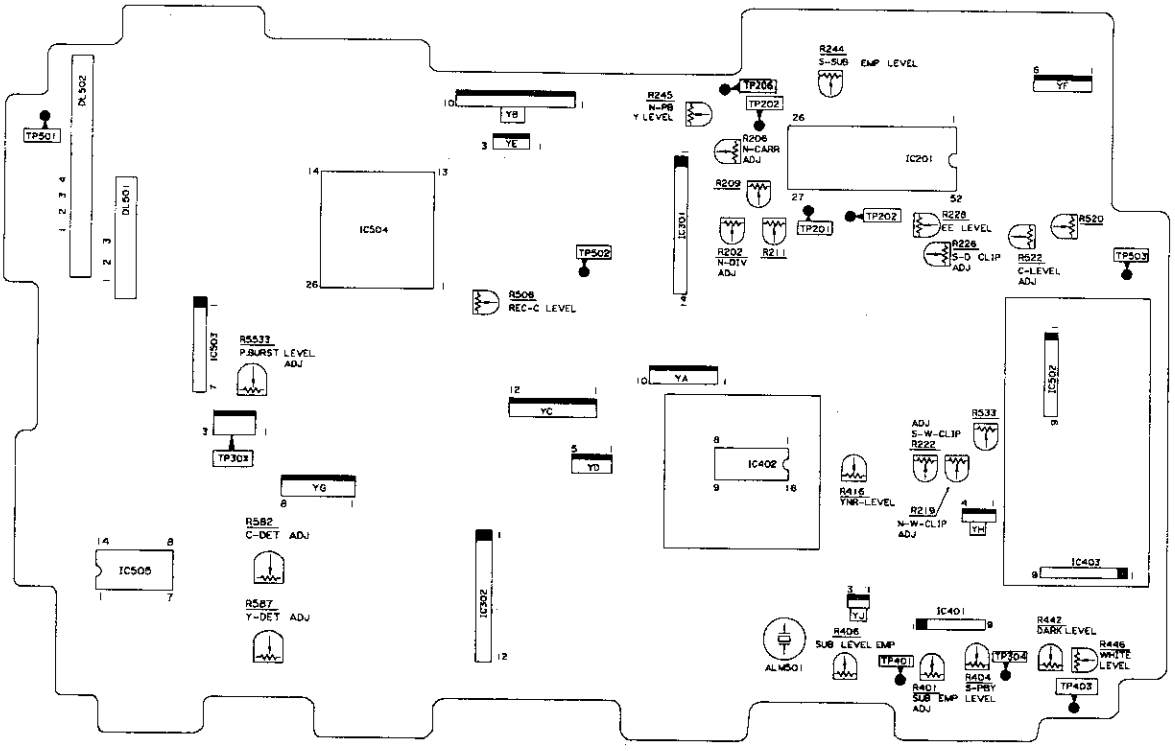



**Figure. 2-12 (a). Y/C PWB**

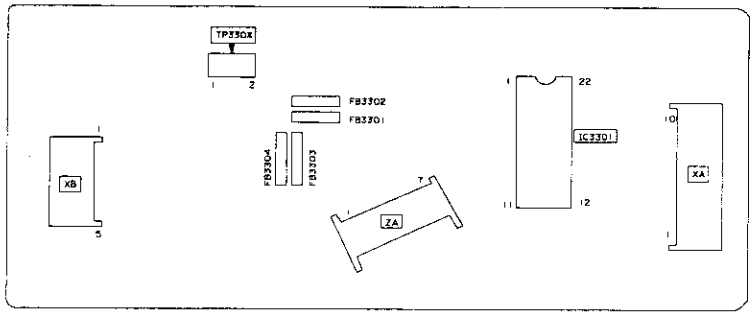
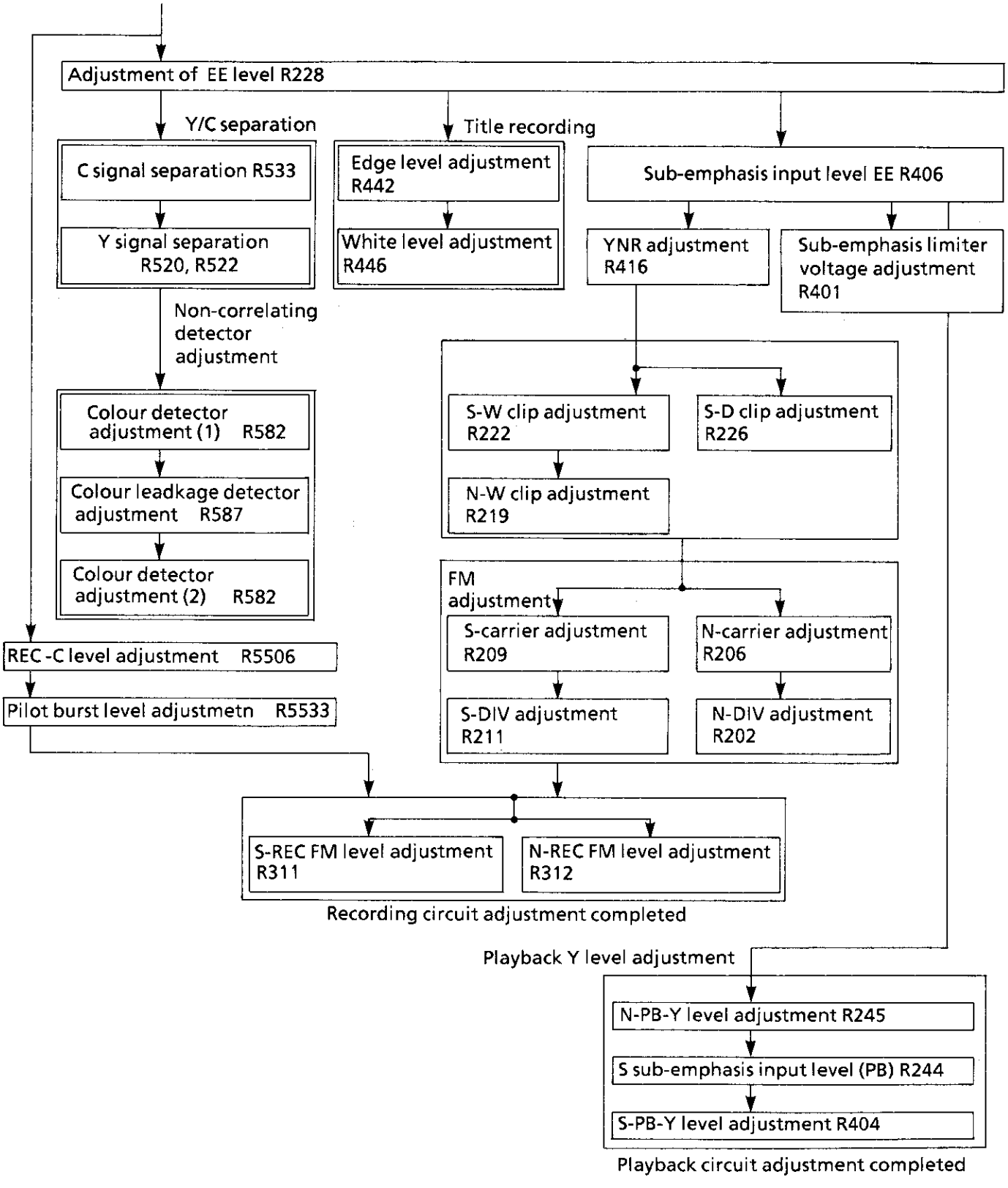



**Figure. 2-12 (b). HEAD AMP PWB**

## REMARKS ON ADJUSTMENT

**Guide to adjusting Y/C circuit:**
When adjusting any of the potentiometers shown in the following flowchart, make sure the potentiometers referred to in the preceding steps have already been adjusted properly.
Whenever you have adjusted a potentiometer, all the potentiometers in the succeeding steps should also be adjusted. The EE level is used as a reference for most adjustments in the following porcedure. Special attention should be given to the adjustment of the EE level.


Adjustment of EE level R228
Y/C separation
Title recording
C signal separation R533
Y signal separation R520, R522
Edge level adjustment R442
White level adjustment R446
Sub-emphasis input level EE R406
YNR adjustment R416
Sub-emphasis limiter voltage adjustment R401
Non-correlating detector adjustment
Colour detector adjustment (1) R582
Colour leadkage detector adjustment R587
Colour detector adjustment (2) R582
S-W clip adjustment R222
S-D clip adjustment R226
N-W clip adjustment R219
FM adjustment
S-carrier adjustment R209
N-carrier adjustment R206
S-DIV adjustment R211
N-DIV adjustment R202
REC -C level adjustment R5506
Pilot burst level adjustmetn R5533
S-REC FM level adjustment R311
N-REC FM level adjustment R312
Recording circuit adjustment completed
Playback Y level adjustment
N-PB-Y level adjustment R245
S sub-emphasis input level (PB) R244
S-PB-Y level adjustment R404
Playback circuit adjustment completed

## ■ ADJUSTMENT OF Y/C RECORDING CIRCUIT

### Adjustment of EE level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE |
| Input signal | Colour bar signal |
| Test point | S-output Y-terminal |
| Control | R228: EE level control |
| Specification | 2.0 ± 0.05 Vp-p |

1) Set the unit to the EE mode. Feed the colour bar signal.
2) Adjust R228 so that the output level at S-output Y-terminal be 2.0 ± 0.05 Vp-p. (S-output Y-terminal open)

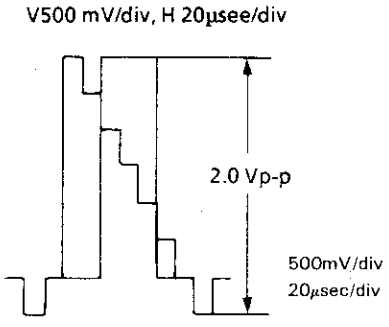



Figure. 2-13.

### Adjustment of chroma separator

| | |
|---|---|
| Measuring instrument | Spectrum analyzer |
| Mode | EE |
| Input signal | Tracking signal from spectrum analyzer |
| Test point | TP503 |
| Control | R533: Chroma Separator Control |
| Specification | R533: Comb-tooth depth to be more than 40 dB |

1) Set the unit to the EE mode. Feed the colour bar signal and observe the output at TP503 on the spectrum analyzer screen.
2) Adjust R533 so that the comb-tooth depth is maximized (more thatn 40 dB).

**Note:** R533 is factory-preset for optimum colour comb by the use of special measuring equipment. Due to the lack of this equipment, on-site adjustment of R533 is extremely difficult. It is therefore recommended not to readjust R533 unless it has become defective. In case readjustment is absolutely required, set R533 at the center position.

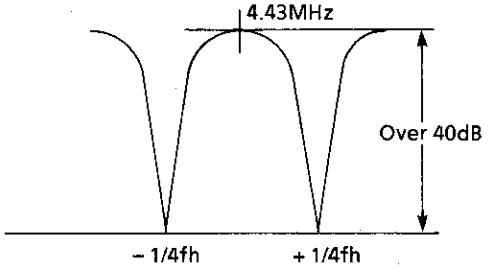



Figure. 2-14.

### Adjustment of luminance separator, phase

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE |
| Input signal | Colour bar signal |
| Test point | TP401 |
| Control | R520, R522 |
| Specification | Minimum chroma component at stair-case waveform |

1) Set the unit to the EE mode.
   Feed the colour bar signal and observe the output at TP401 in the Y/C unit on the oscilloscope screen.
2) Alternately turn R520 and R522 so that the chroma component at the stair-case waveform should be minimum.

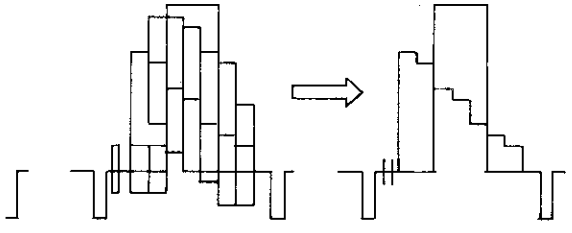


Figure. 2-15.

### Adjustment of sub-emphasis input level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE |
| Input signal | Colour bar signal |
| Test point | TP401 |
| Control | R406: Sub-emphasis input level control |
| Specification | 0.4 ± 0.03 Vp-p |

1) Set the unit to the EE mode. Feed the colour bar signal, and observe the output at TP401 on the oscilloscope screen.
2) Adjust R406 so that the output level at TP401 be 0.4 ± 0.03 Vp-p.

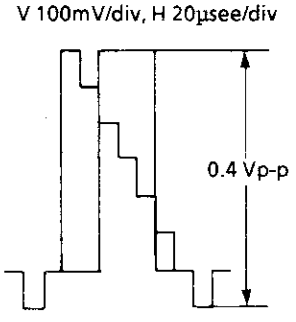



Figure. 2-16.

### Adjustment of out-of-phase detection level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE |
| Input signal | Colour bar signal |
| Test point | TP205, TP206 |
| Control | R582 C-out-of phase detection level<br>R587 Y-out-of phase detection level |
| Specification | Minimize the switching noise which appears in vertical patterns to the right of the colour bar edges. |

1) Adjustment of colour signal detector (R582). Turn R582 fully clockwise.
2) Colour leakage adjustment (R587)
Feed the colour bar signal to the AUX input terminal to show the colour bar pattern on the TV screen. Connect a resistor of about 56 kΩ between TP206 (collector of Q410) and TP205 (5V). Adjust R587 so that the vertical switching noise patterns to the right of the colour bar edges just disappear. Then, disconnect the resistor.

### Adjustment of title recording

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Title recording |
| Input signal | Colour bar signal |
| Test point | TP401 |
| Control | R442: Gray level adjustment<br>R446: White level adjustment |
| Specification | Gray level: 15 ± 5%<br>White level: 15 ± 5% |

1) Select title recording mode.
2) With reference (100%) to the luminance signal amplitude of the colour bar signal above the sync signal level, adjust the gray level by R442 as shown in the figure below. Then, adjust the white level by R446.

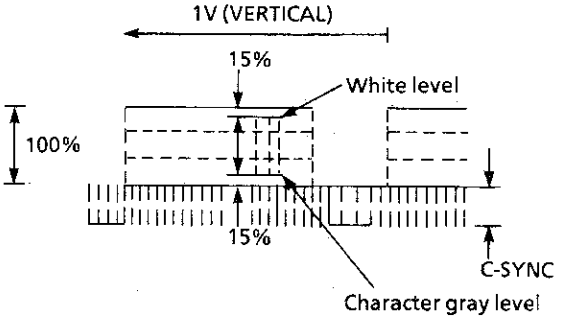



Figure. 2-17.

### Adjustment of luminance NR-mix level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE LP |
| Input signal | Colour bar signal |
| Test point | TP202 |
| Control | R416: Y-NR-mix level control |
| Specification | Video signal component to be minimum (30 mVpp or less) |

1) Set the unit to the EE mode. Feed the colour bar signal and observe the output at TP202 on the Oscilloscope screen.
2) Adjust R416 so that the video signal component is minimized.

### Adjustment of sub-emphasis limiter voltage

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE (S-VHS) |
| Input signal | No signal |
| Test point | TP402 |
| Control | R401: Sub-emphasis limiter voltage control |
| Specification | 3.48 ± 0.05V |

1) Set the unit to the EE mode. With no signal input.
2) Adjust R401 so that the DC voltage at TP402 be 3.48 ± 0.05 V.

### Adjustment of white clip level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE (VHS, S-VHS) |
| Input signal | Colour bar signal |
| Test point | TP201 |
| Control | R222: S-VHS white clip level control<br>R219: VHS white clip level control |
| Specification | 108 + 4%, –8% S-VHS white clip<br>80 + 5%, –10% VHS white clip |

1) Set the unit to the S-VHS mode. Feed the colour bar signal and observe the output at TP210 on the oscilloscope screen.
2) Adjust R222 so that the white clip level at TP201 is 108% of entire signal.
3) Next set the unit to the VHS mode. Adjust R219 so that the white clip level at TP201 is 80% of entire signal.

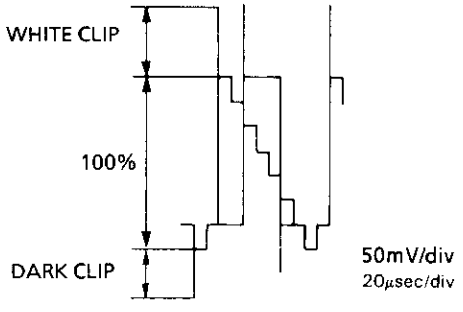



Figure. 2-18.

### Adjustment of dark clip level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE (VHS, S-VHS) |
| Input signal | Colour bar signal |
| Test point | TP201 |
| Control | R226: S-VHS dark clip level control |
| Specification | 80 ± 10% S-VHS dark clip level |

1) Set the unit to the S-VHS mode. Adjust R226 so that the dark clip level at TP201 is 80% of entire signal.

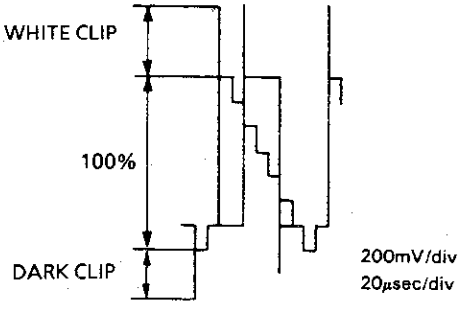



Figure. 2-19.

### Adjustment of S-VHS mode carrier and deviation

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE recording |
| Input signal | No signal AUX mode (carrier)<br>Colour bar signal (deviation) |
| Test point | TP306 carrier<br>TP201 deviation |
| Control | R209: S-VHS carrier control<br>R211: S-VHS deviation control |
| Specification | Carrier: 5.5 ± 0.05 MHz<br>Deviation: 2.0 ± 0.05 Vp-p |

1) Adjustment of S-VHS FM carrier
Select AV mode (no video signal) and set the record mode select switch SW8101) to S-VHS. Load the S-VHS self-recording tape and set the unit to REC mode. With a frequency counter connected to TP306, adjust R209 so that the frequency counter indicates 5.50 MHz.

2) Adjustment of S-VHS frequency deviation
Select AV mode (video colour bar) and set the record mode select switch to S-VHS. Load the S-VHS self-recording tape and set the unit to REC mode. Connect an oscilloscope to TP201 and record the signal level shown on the oscilloscope. Then, connect the oscilloscope to the VIDEO OUT terminal (OPEN) and play back the tape. Check that the oscilloscope indicates 2.0 Vpp. If the signal amplitude deviates from 2.0 Vpp, coarsely adjust the signal at TP201 by R211 at first. Further adjust R211 repeatedly until the signal at the VIDEO OUTPUT terminal becomes 2.0 Vpp exactly.

**Example:** In case the measured signal is 1.0 Vpp at the VIDEO OUTPUT terminal and 0.1 Vpp at TP201, adjust the signal at TP201 to 0.2 Vpp. The VIDEO OUTPUT signal will become 2.0 Vpp.

**Adjustment of VHS mode carrier and deviation**

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | EE recording |
| Input signal | No signal (carrier)<br>Colour bar signal (deviation) |
| Test point | TP306 carrier<br>TP201 deviation |
| Control | R206: VHS carrier control<br>R202: VHS deviation control |
| Specification | Carrier: 3.86 ± 0.05 MHz<br>Deviation: 2.0 ± 0.05 Vp-p |

1) Adjustment of VHS FM carrier
Select AV mode (no video signal) and set the record mode select switch to NORMAL. Load the S-VHS self-recording tape and set the unit to REC mode. With a frequency counter connected to TP306, adjust R206 so that the frequency counter indicates 3.86 MHz.

2) Adjustment of VHS frequency deviation
Select AV mode (video colour bar) and set the record mode select switch to NORMAL. Load the S-VHS self-recording tape and set the unit to REC mode. Connect an oscilloscope to TP201 and record the signal level shown on the oscilloscope. Then, connect the oscilloscope to the VIDEO OUT terminal (OPEN) and play back the tape. Check that the oscilloscope indicates 2.0 Vpp. If the signal amplitude deviates from 2.0 Vpp, coarsely adjust the signal at TP201 by R202 at first. Further ajdust R202 repeatedly until the signal at the VIDEO OUTPUT terminal becomes 2.0 Vpp exactly.

**Adjustment of recording chroma**

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | LP recording mode |
| Input signal | Colour bar signal (line input terminal) |
| Test point | TP3301, TP3302 (in head amplifier unit) |
| Control | R5506: REC chroma control |
| Specification | 27.5 ± 2mVp-p |

1) Short out between TP306 and TP205. Both TP306 and TP205 are located in the Y/C unit.
2) Feed the color bar signal to the line input terminal. Set the unit to the LP recording mode.
3) Observe the outputs at TP3301 and TP3302 on the oscilloscope screen. Adjust the red output to the specified level.

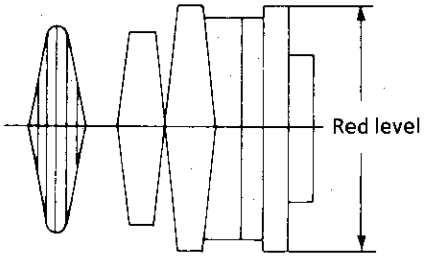



**Figure. 2-20.**

**Adjustment of pilot burst level**

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | LP recording mode (S-VHS) |
| Input signal | Colour bar signal (line input terminal) |
| Test point | TP3301, TP3302 (in head amplifier unit) |
| Control | R5533 (Pilot burst level control) |
| Specification | ± 2 mVpp of normal colour burst signal level |

1) Short out between TP306 and TP205. Both TP306 and TP205 are located in the Y/C unit.
2) Feed the colour bar signal to the line input terminal. Set the unit to the LP recording mode.
3) Observe the outputs at TP3301 and TP3302 on the oscilloscope screen. Adjust R5533 so that the pilot burst signal level aligns with the normal colour burst signal level.

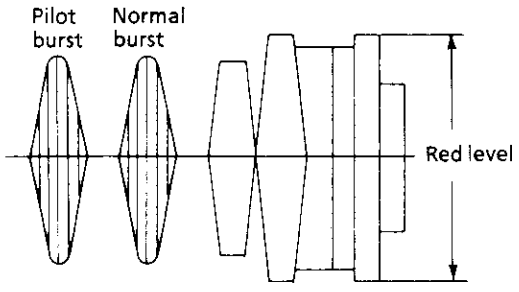



Figure. 2-21.

**Adjustment of recording FM**

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | LP recording mode |
| Input signal | Colour bar signal (line input terminal) |
| Test point | TP3301, TP3302 (in head amplifier unit) |
| Control | R311 (in IC301): REC FM current control (S-VHS) mode)<br>R312 (in IC301): REC FM current control (VHS) mode) |
| Specification | 110 ± 5 mVp-p |

- Remove the shorting jumper between TP306 and TP205.
  Adjust the sync tip to the specified level.

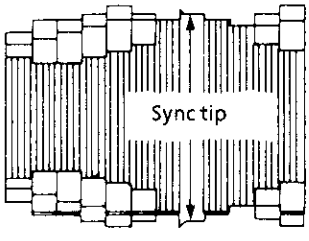



Figure. 2-22.

**Adjustment of normal VHS playback level**

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback (VHS) |
| Input signal | Colour bar signal |
| Test point | S-output Y-terminal |
| Control | R245: VHS playback level control |
| Specification | 10 ± 0.05Vp-p |

1) Set the unit to the VHS mode. Playback the standard colour bar signal tape and observe the level across the resistor at the line output terminal on the oscilloscope screen.
2) Adjust R245 so that the output level at the S-output Y-terminal be 1.0 ± 0.05Vp-p.

**Adjustment of playback sub-emphasis input level**

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback (VHS) |
| Input signal | Colour bar signal |
| Test point | TP401 |
| Control | R244: Playback sub-emphasis level control |
| Specification | 0.4 ± 0.05Vp-p |

1) Set the unit to the S-VHS mode. Playback the standard colour bar signal tape and observe the output at TP401 on the oscilloscope screen.
2) Adjust R244 so that the output level at TP401 be 0.4 ± 0.05 Vp-p.

**Adjustment of S-VHS playback level**

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback (S-VHS) |
| Tape used | S-VHS Alignment tape |
| Input signal | ——— |
| Test point | S-output Y-terminal |
| Control | R404: S-VHS playback level control |
| Specification | 2.0 ± 0.05Vp-p |

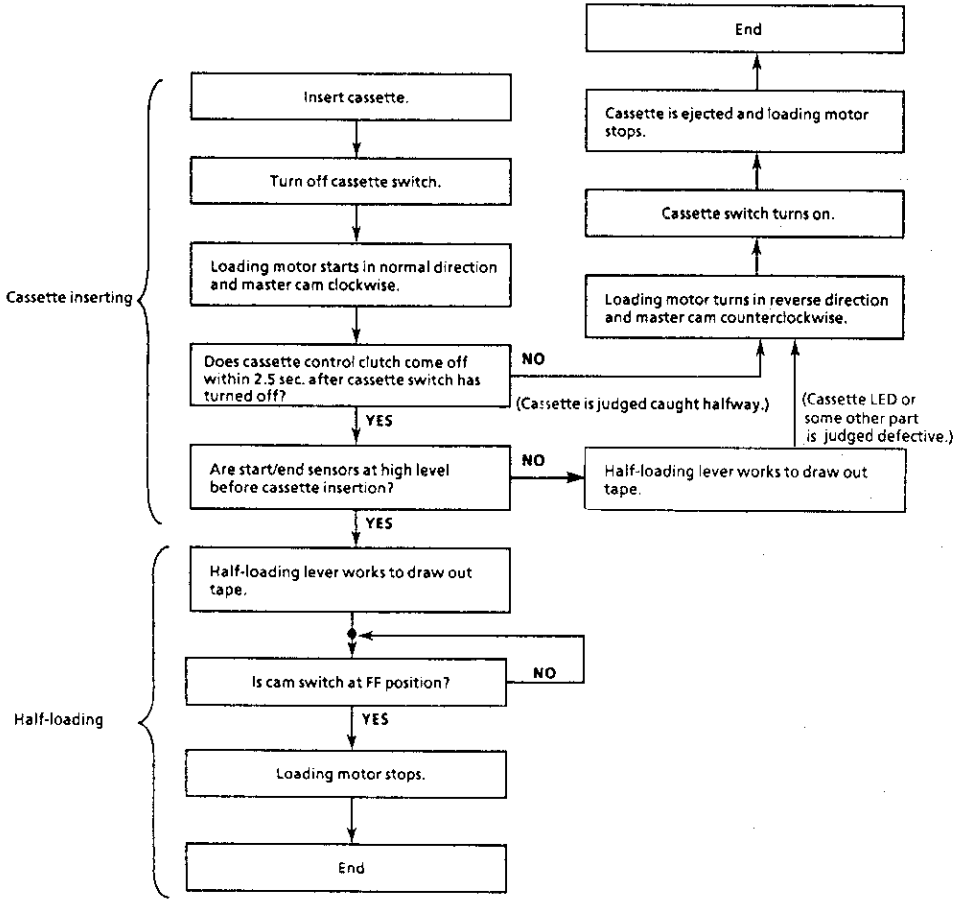
1) Playback the S-VHS alignment tape and observe the signal at the video output jack.
2) Adjust R404 so that the output level at the S-output Y-terminal be 2.0 ± 0.05 Vp-p.
   (S-output Y-terminal open)

# TROUBLESHOOTING FLOWCHART

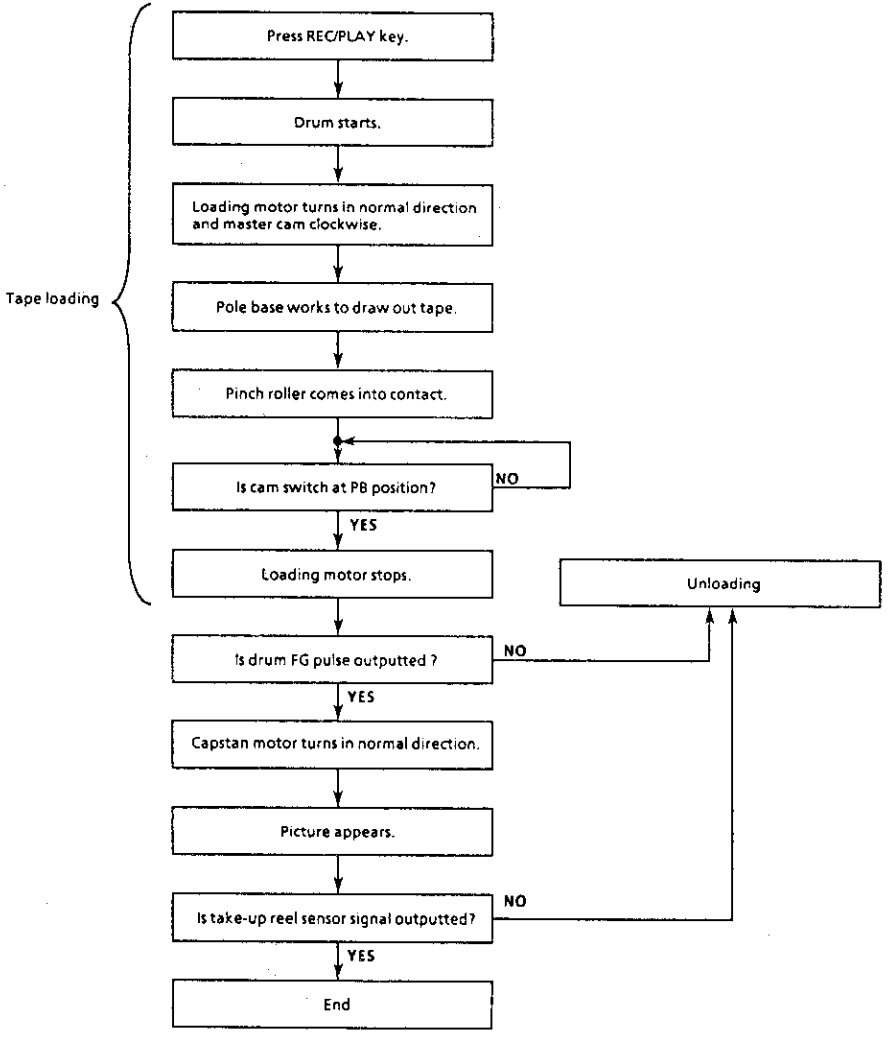
## MECHANISM OPERATION FLOWCHART

- This flowchart describes the outline of the mechanism's operation, but does not give its details.
- For cam switch positions, see Fig. 3-2.

### CASSETTE INSERTION → STOP


Cassette inserting
Insert cassette.
Turn off cassette switch.
Loading motor starts in normal direction and master cam clockwise.
Does cassette control clutch come off within 2.5 sec. after cassette switch has turned off?
NO
(Cassette is judged caught halfway.)
YES
Are start/end sensors at high level before cassette insertion?
NO
YES
Half-loading lever works to draw out tape.
End
Cassette is ejected and loading motor stops.
Cassette switch turns on.
Loading motor turns in reverse direction and master cam counterclockwise.
(Cassette LED or some other part is judged defective.)
Half-loading
Half-loading lever works to draw out tape.
Is cam switch at FF position?
NO
YES
Loading motor stops.
End

### STOP → REC/PLAY

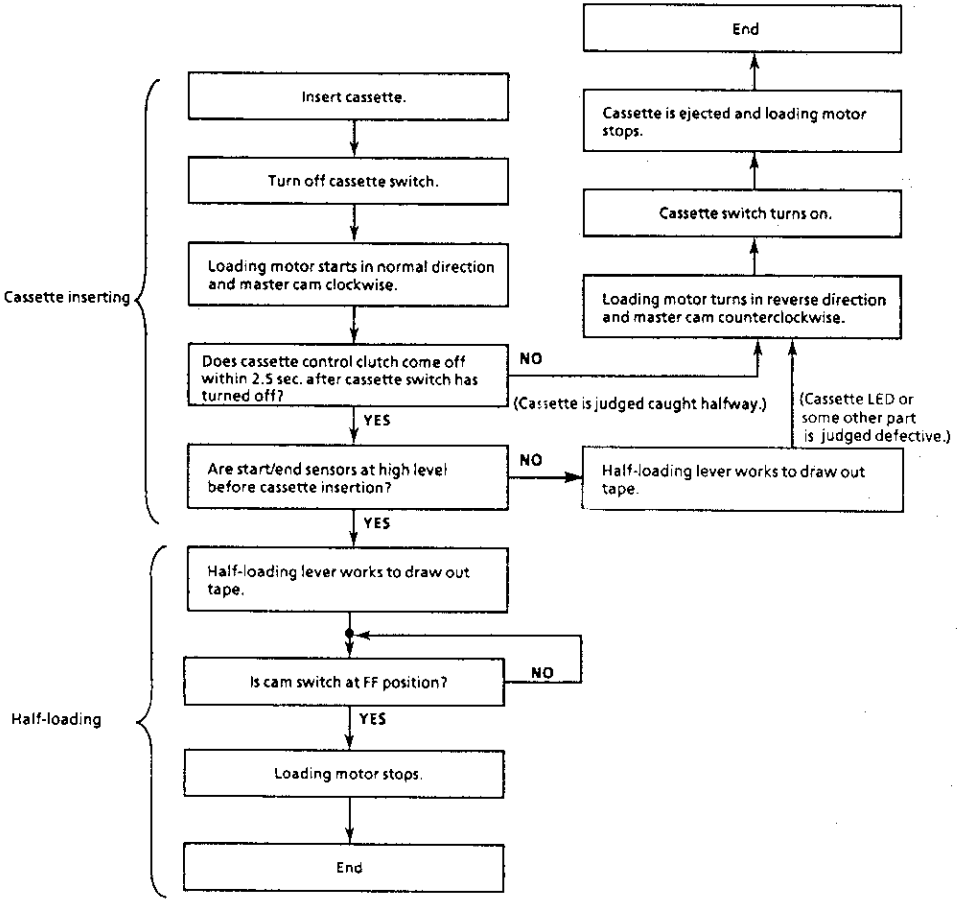


# TROUBLESHOOTING FLOWCHART

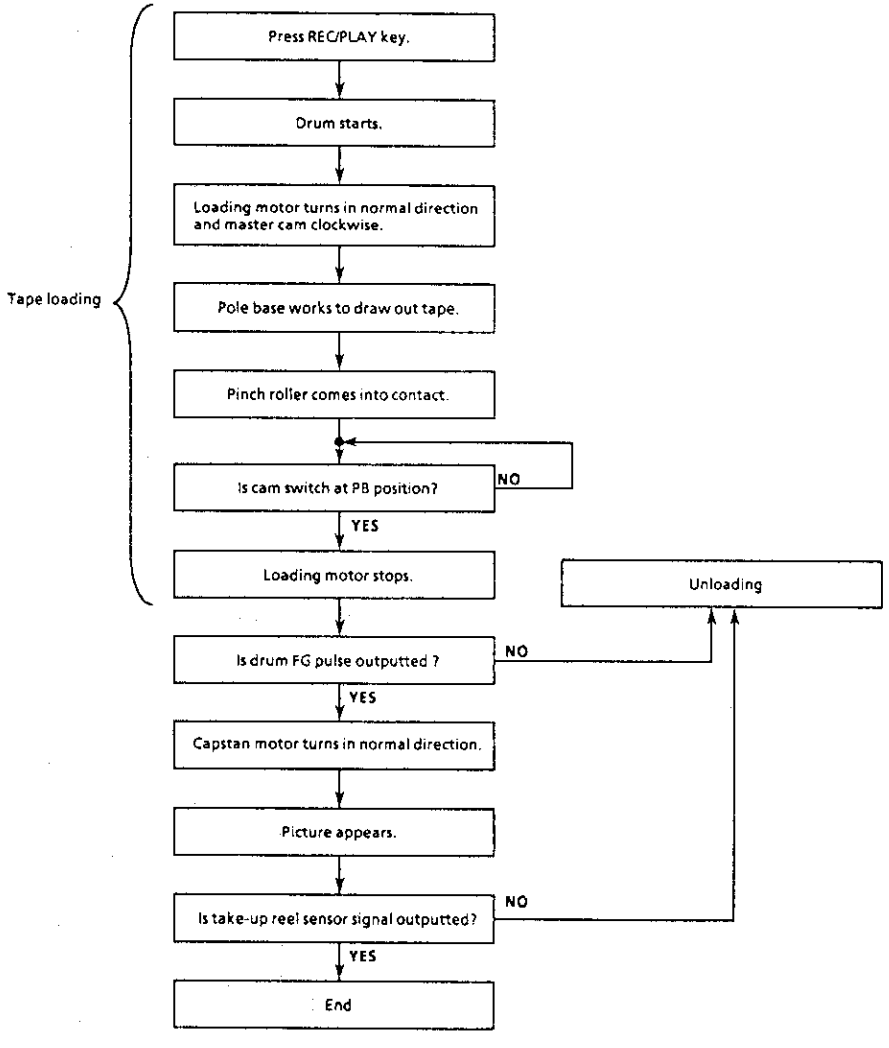
## MECHANISM OPERATION FLOWCHART

- This flowchart describes the outline of the mechanism's operation, but does not give its details.
- For cam switch positions, see Fig. 3-2.

### CASSETTE INSERTION → STOP


Cassette inserting
Insert cassette.
Turn off cassette switch.
Loading motor starts in normal direction and master cam clockwise.
Does cassette control clutch come off within 2.5 sec. after cassette switch has turned off?
NO
(Cassette is judged caught halfway.)
YES
Are start/end sensors at high level before cassette insertion?
NO
Half-loading lever works to draw out tape.
YES
Half-loading
Half-loading lever works to draw out tape.
Is cam switch at FF position?
NO
YES
Loading motor stops.
End
Loading motor turns in reverse direction and master cam counterclockwise.
Cassette switch turns on.
Cassette is ejected and loading motor stops.
End
(Cassette LED or some other part is judged defective.)

### STOP → REC/PLAY



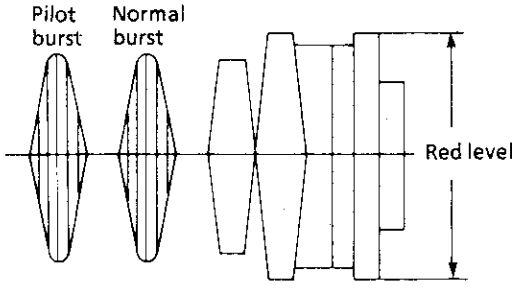



Figure. 2-21.

### Adjustment of recording FM

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | LP recording mode |
| Input signal | Colour bar signal (line input terminal) |
| Test point | TP3301, TP3302 (in head amplifier unit) |
| Control | R311 (in IC301): REC FM current control (S-VHS) mode)<br>R312 (in IC301): REC FM current control (VHS) mode) |
| Specification | 110 ± 5 mVp-p |

- Remove the shorting jumper between TP306 and TP205.
  Adjust the sync tip to the specified level.

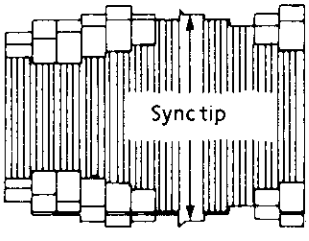



Figure. 2-22.

### Adjustment of normal VHS playback level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback (VHS) |
| Input signal | Colour bar signal |
| Test point | S-output Y-terminal |
| Control | R245: VHS playback level control |
| Specification | 10 ± 0.05Vp-p |

1) Set the unit to the VHS mode. Playback the standard colour bar signal tape and observe the level across the resistor at the line output terminal on the oscilloscope screen.
2) Adjust R245 so that the output level at the S-output Y-terminal be 1.0 ± 0.05Vp-p.

### Adjustment of playback sub-emphasis input level

| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback (VHS) |
| Input signal | Colour bar signal |
| Test point | TP401 |
| Control | R244: Playback sub-emphasis level control |
| Specification | 0.4 ± 0.05Vp-p |

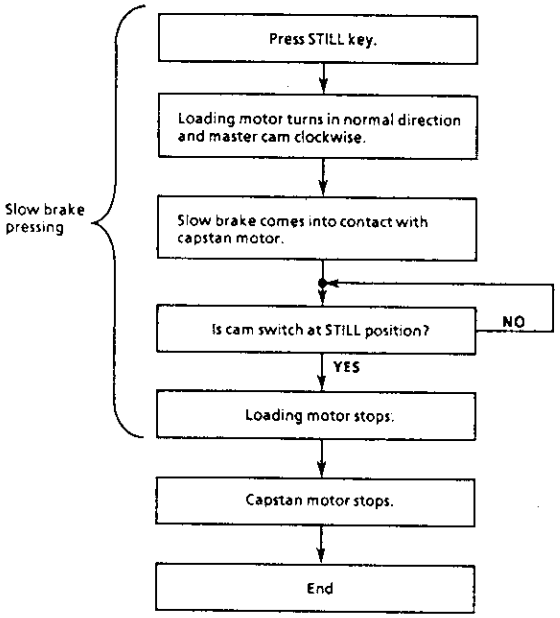
1) Set the unit to the S-VHS mode. Playback the standard colour bar signal tape and observe the output at TP401 on the oscilloscope screen.
2) Adjust R244 so that the output level at TP401 be 0.4 ± 0.05 Vp-p.

### Adjustment of S-VHS playback level

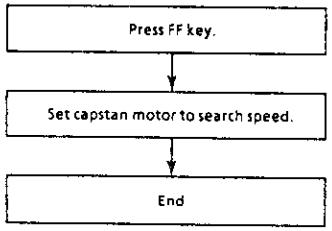
| | |
|---|---|
| Measuring instrument | Oscilloscope |
| Mode | Playback (S-VHS) |
| Tape used | S-VHS Alignment tape |
| Input signal | ———— |
| Test point | S-output Y-terminal |
| Control | R404: S-VHS playback level control |
| Specification | 2.0 ± 0.05Vp-p |

1) Playback the S-VHS alignment tape and observe the signal at the video output jack.
2) Adjust R404 so that the output level at the S-output Y-terminal be 2.0 ± 0.05 Vp-p.
   (S-output Y-terminal open)

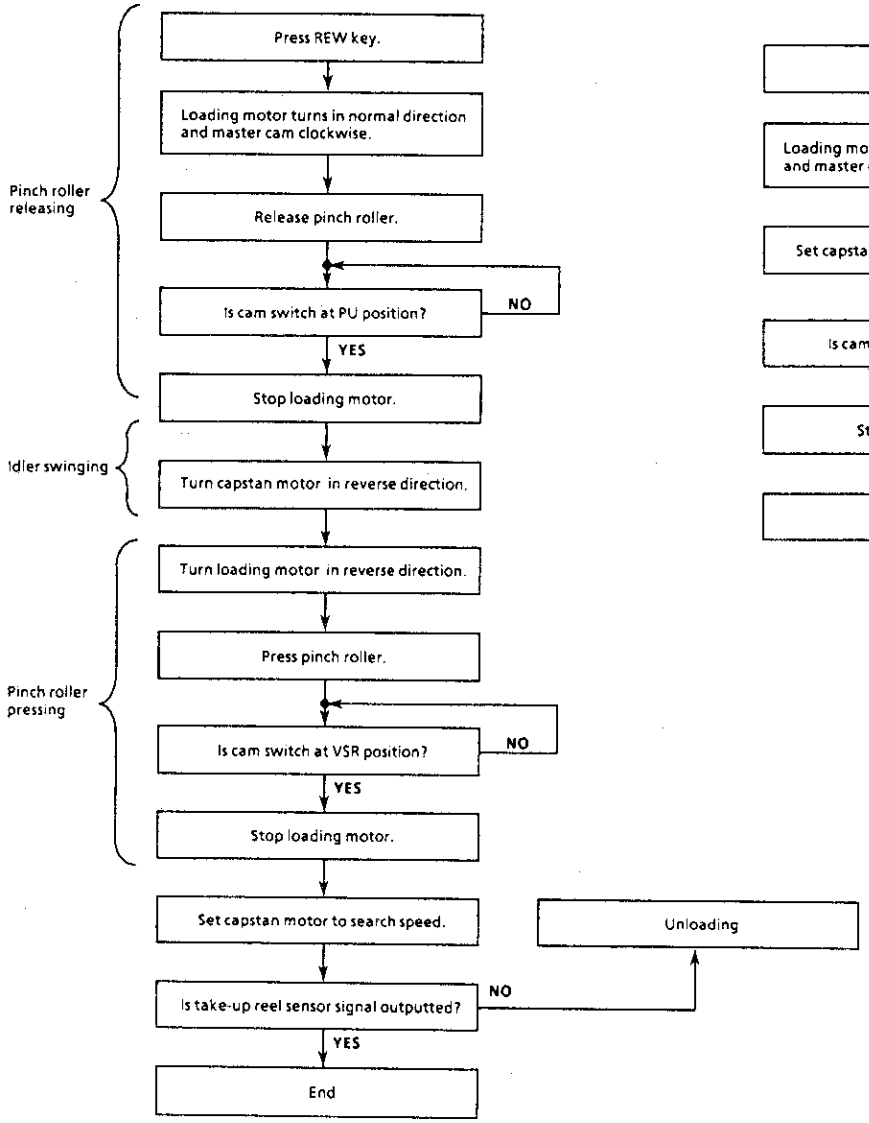
## PLAY → STILL



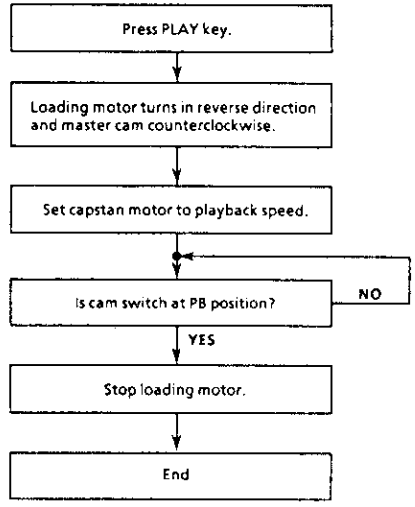

## PLAY → VSF

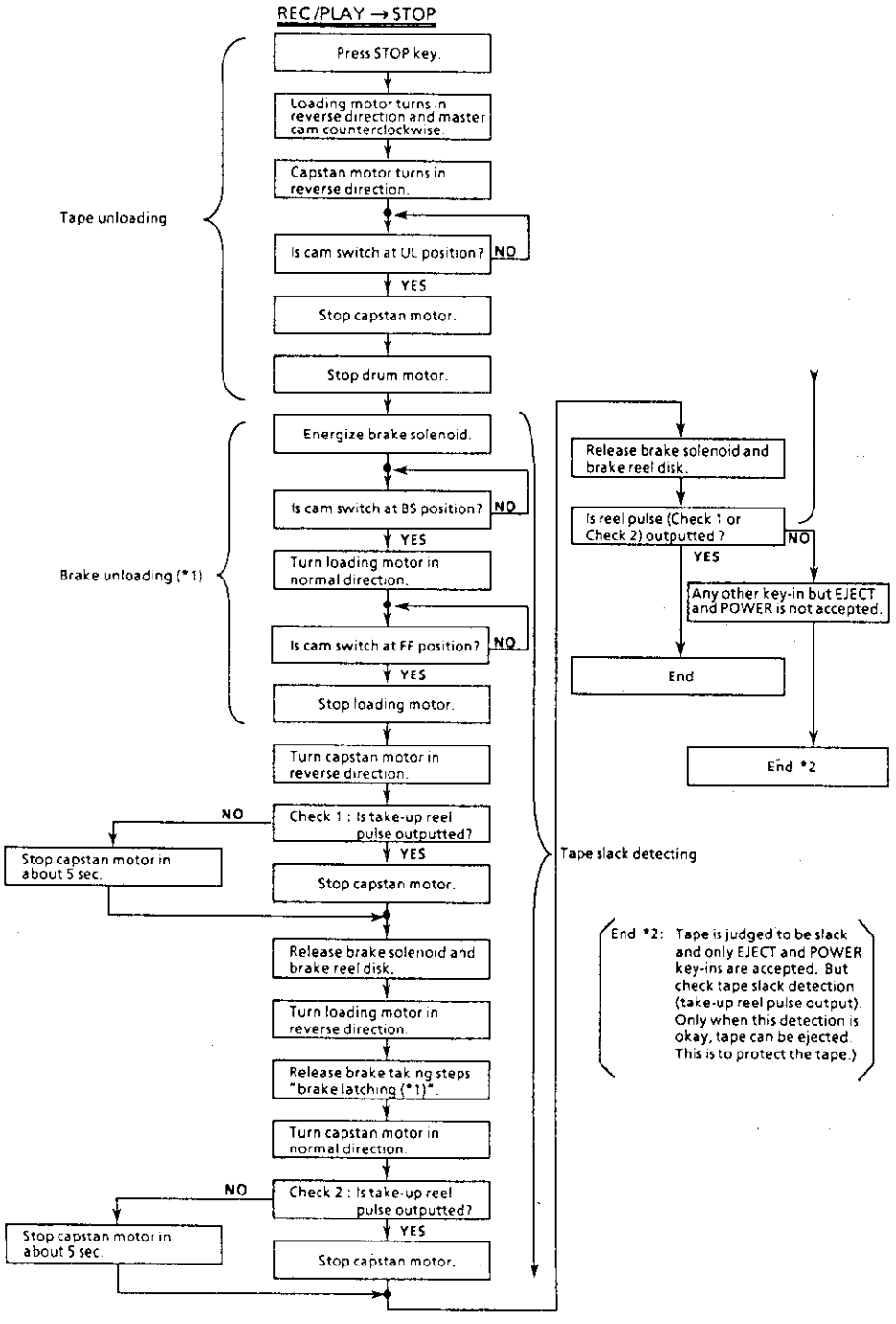


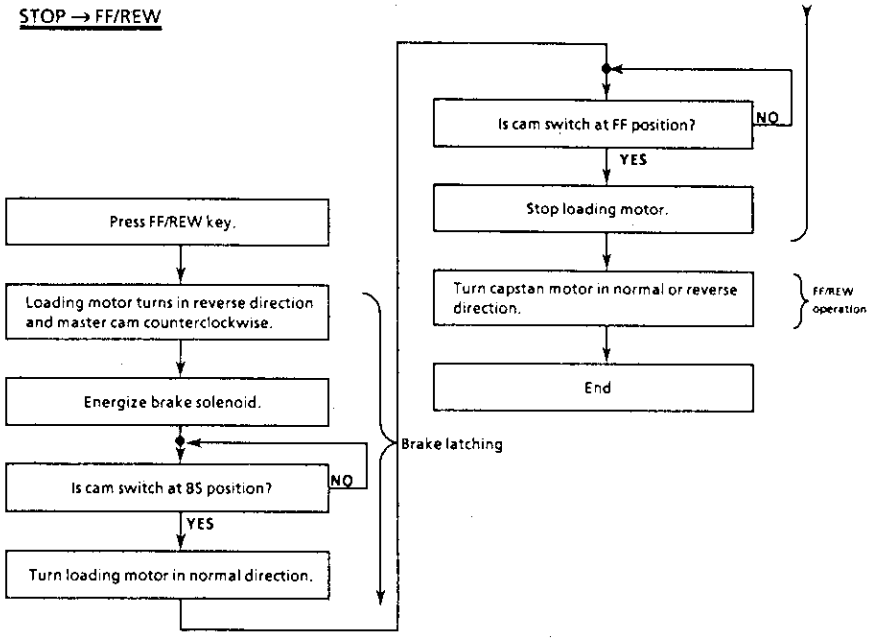

## PLAY → VSR

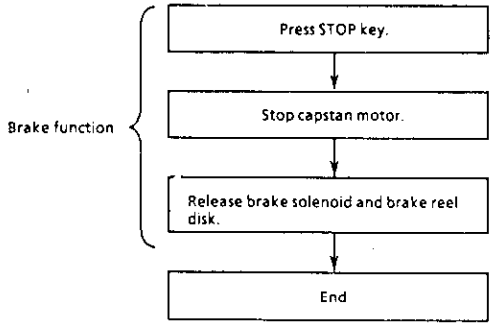



## VSR → PLAY

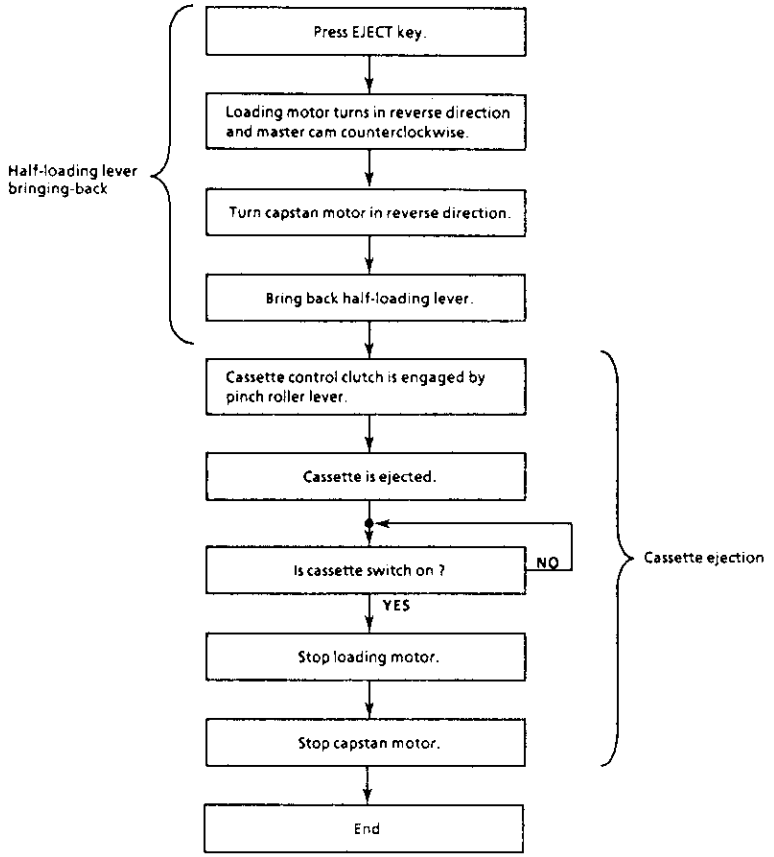



REC/PLAY → STOP
Press STOP key.
Loading motor turns in reverse direction and master cam counterclockwise.
Capstan motor turns in reverse direction.
Is cam switch at UL position?
NO
YES
Stop capstan motor.
Stop drum motor.
Tape unloading
Energize brake solenoid.
Is cam switch at BS position?
NO
YES
Turn loading motor in normal direction.
Is cam switch at FF position?
NO
YES
Stop loading motor.
Brake unloading (*1)
Turn capstan motor in reverse direction.
Check 1 : Is take-up reel pulse outputted?
NO
YES
Stop capstan motor in about 5 sec.
Stop capstan motor.
Release brake solenoid and brake reel disk.
Turn loading motor in reverse direction.
Release brake taking steps "brake latching (*1)".
Turn capstan motor in normal direction.
Check 2 : Is take-up reel pulse outputted?
NO
YES
Stop capstan motor in about 5 sec.
Stop capstan motor.
Tape slack detecting
Release brake solenoid and brake reel disk.
Is reel pulse (Check 1 or Check 2) outputted ?
NO
YES
Any other key-in but EJECT and POWER is not accepted.
End
End *2
End *2: Tape is judged to be slack and only EJECT and POWER key-ins are accepted. But check tape slack detection (take-up reel pulse output). Only when this detection is okay, tape can be ejected. This is to protect the tape.)


STOP → FF/REW
Press FF/REW key.
Loading motor turns in reverse direction and master cam counterclockwise.
Energize brake solenoid.
Is cam switch at BS position?
NO
YES
Turn loading motor in normal direction.
Brake latching
Is cam switch at FF position?
NO
YES
Stop loading motor.
Turn capstan motor in normal or reverse direction.
FF/REW operation
End


FF/REW → STOP
Press STOP key.
Stop capstan motor.
Release brake solenoid and brake reel disk.
End
Brake function

STOP → CASSETTE EJECT



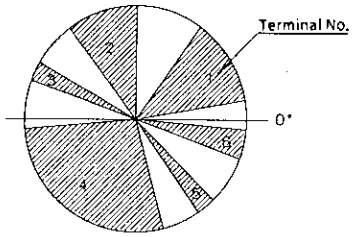




Fig. 3-1 cam switch pattern

- The cam switch has the pattern as shown in Fig. 3-1. The circuit turns on when the signal comes on the shaded zones on the switch. The six pattern signals are judged to be on or off by the system controller in order to detect the mechanism modes.

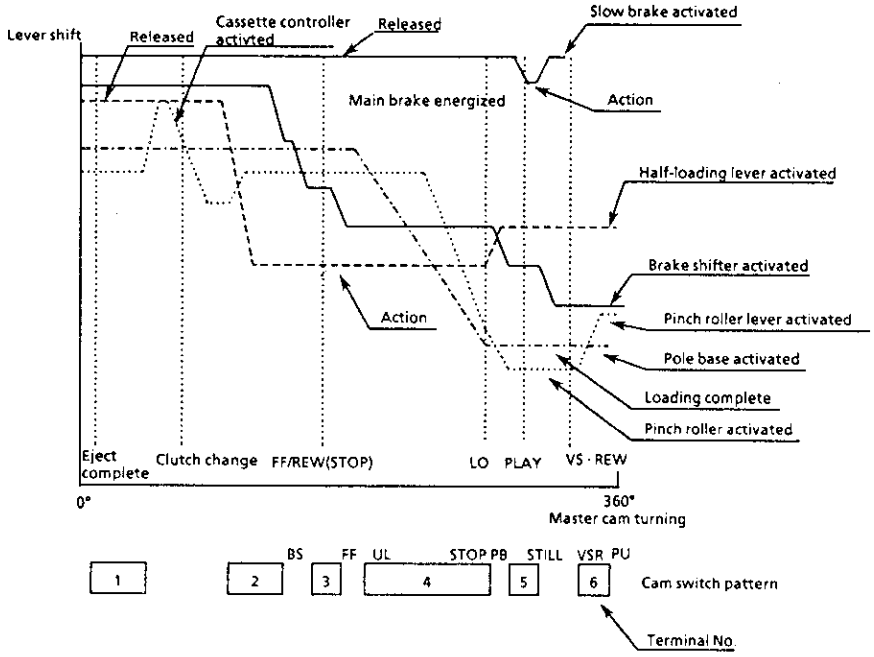
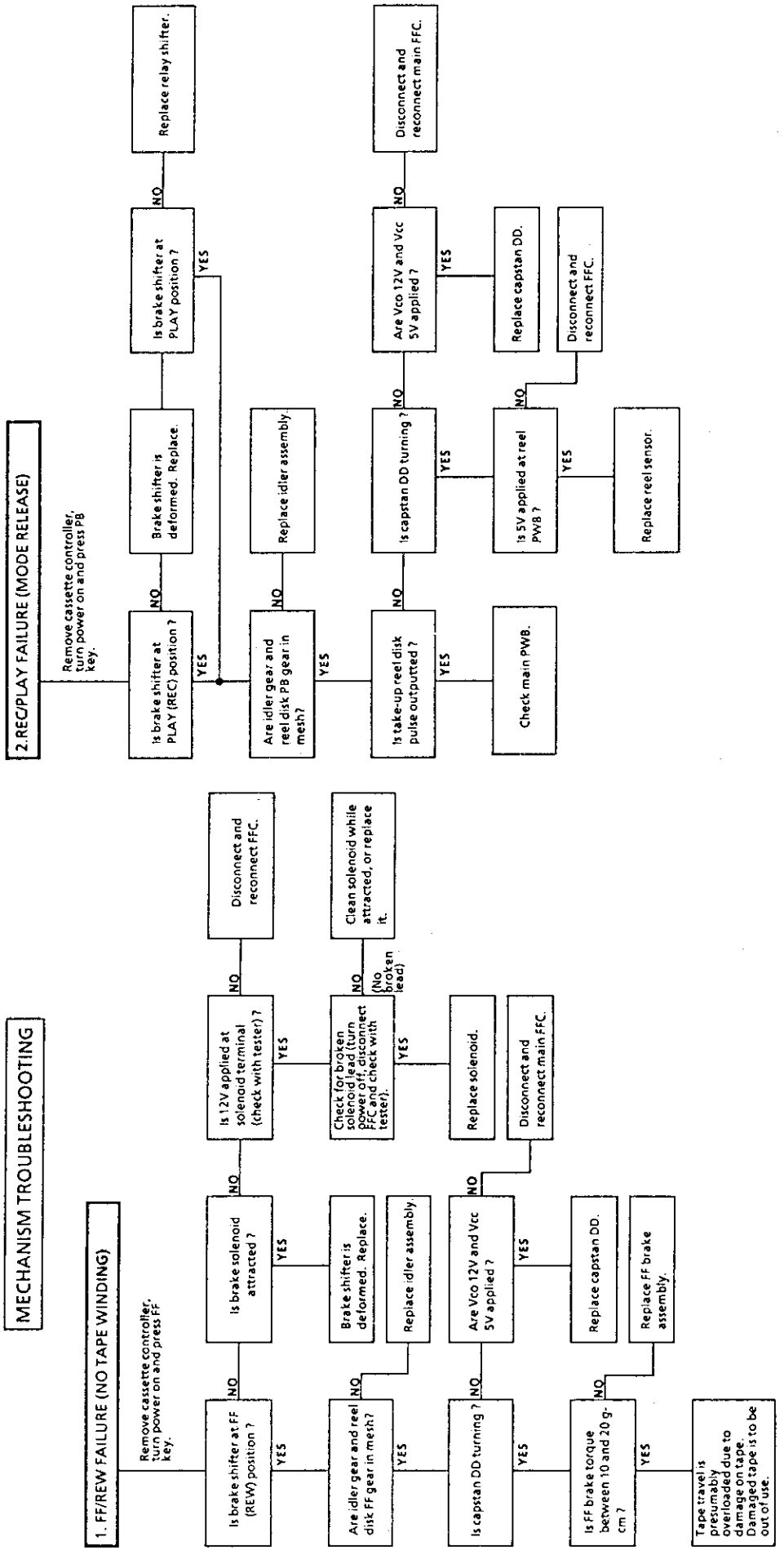
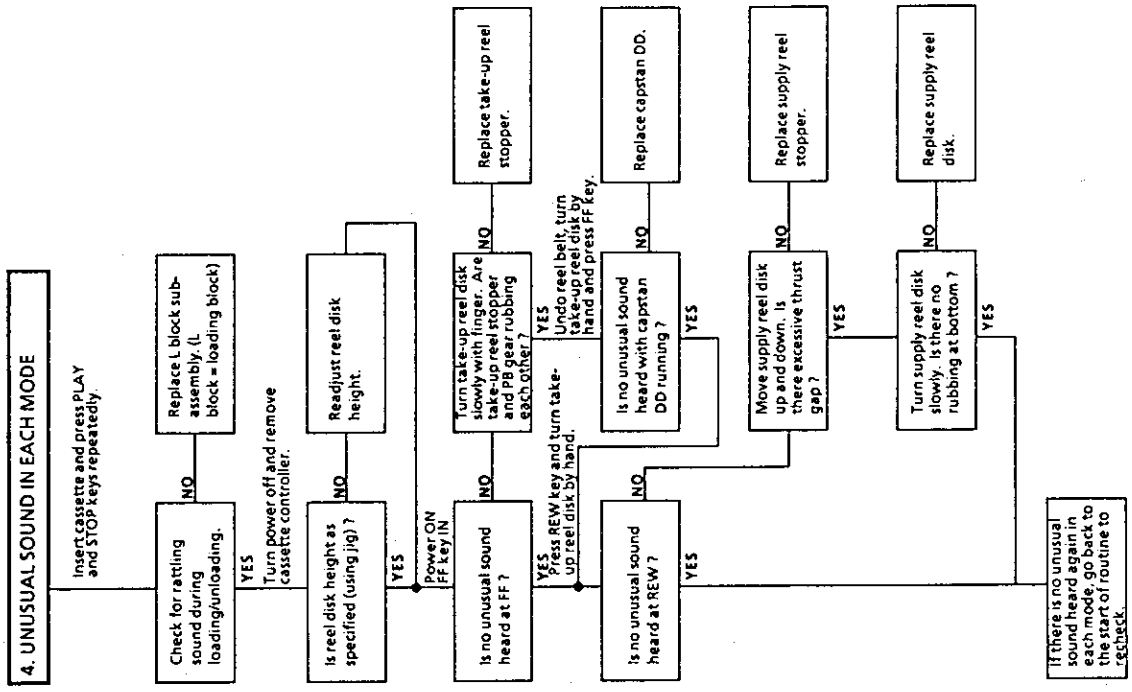


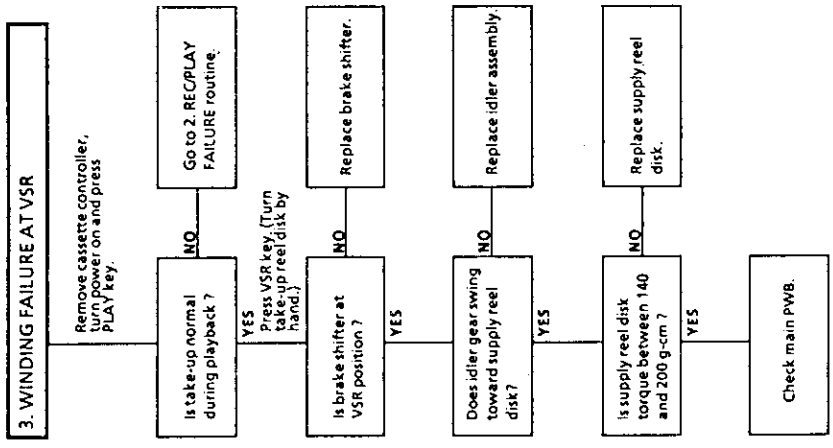

Fig. 3-2 Relationship between cam switch positions and mechanism movement

The relationship between the cam switch positions and the mechanism movement is shown in Fig. 3-2.

# MECHANISM TROUBLESHOOTING

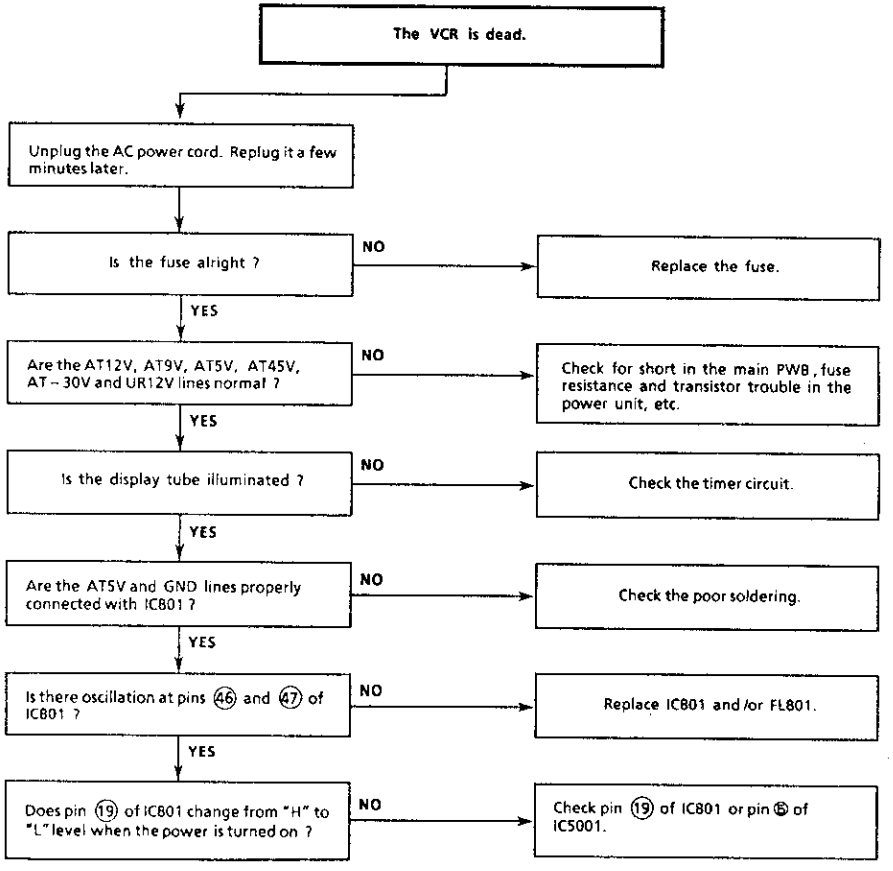

1. FF/REW FAILURE (NO TAPE WINDING)
Remove cassette controller, turn power on and press FF key.
Is brake shifter at FF (REW) position ?
NO
YES
Is brake solenoid attracted ?
NO
YES
Is 12V applied at solenoid terminal (check with tester) ?
NO
YES
Disconnect and reconnect FFC.
Brake shifter is deformed. Replace.
Check for broken solenoid lead (turn power off, disconnect FFC and check with tester).
NO (No broken lead)
YES
Clean solenoid while attracted, or replace it.
Are idler gear and reel disk FF gear in mesh?
NO
YES
Replace idler assembly.
Replace solenoid.
Is capstan DD turning ?
NO
YES
Are Vco 12V and Vcc 5V applied ?
NO
YES
Disconnect and reconnect main FFC.
Is FF brake torque between 10 and 20 g-cm ?
NO
YES
Replace capstan DD.
Replace FF brake assembly.
Tape travel is presumably overloaded due to damage on tape. Damaged tape is to be out of use.
2.REC/PLAY FAILURE (MODE RELEASE)
Remove cassette controller, turn power on and press PB key.
Is brake shifter at PLAY (REC) position ?
NO
YES
Brake shifter is deformed. Replace.
Are idler gear and reel disk PB gear in mesh?
NO
YES
Replace idler assembly.
Is take-up reel disk pulse outputted ?
NO
YES
Check main PWB.
Is capstan DD turning ?
NO
YES
Is brake shifter at PLAY position ?
NO
YES
Replace relay shifter.
Is 5V applied at reel PWB ?
NO
YES
Disconnect and reconnect FFC.
Are Vco 12V and Vcc 5V applied ?
NO
YES
Replace capstan DD.
Replace reel sensor.


4. UNUSUAL SOUND IN EACH MODE
Insert cassette and press PLAY and STOP keys repeatedly.
Check for rattling sound during loading/unloading.
NO
Replace L block sub-assembly. (L block = loading block)
YES
Turn power off and remove cassette controller.
Is reel disk height as specified (using jig) ?
NO
Readjust reel disk height.
YES
Power ON FF key IN
Is no unusual sound heard at FF ?
NO
Turn take-up reel disk slowly with finger. Are take-up reel stopper and PB gear rubbing each other ?
NO
Replace take-up reel stopper.
YES
Press REW key and turn take-up reel disk by hand.
Undo reel belt, turn take-up reel disk by hand and press FF key.
Is no unusual sound heard at REW ?
NO
Is no unusual sound heard with capstan DD running ?
NO
Replace capstan DD.
YES
Move supply reel disk up and down. Is there excessive thrust gap ?
NO
Replace supply reel stopper.
YES
Turn supply reel disk slowly. Is there no rubbing at bottom ?
NO
Replace supply reel disk.
YES
If there is no unusual sound heard again in each mode, go back to the start of routine to recheck.


3. WINDING FAILURE AT VSR
Remove cassette controller, turn power on and press PLAY key.
Is take-up normal during playback ?
NO
Go to 2. REC/PLAY FAILURE routine.
YES
Press VSR key. (Turn take-up reel disk by hand.)
Is brake shifter at VSR position ?
NO
Replace brake shifter.
YES
Does idler gear swing toward supply reel disk?
NO
Replace idler assembly.
YES
Is supply reel disk torque between 140 and 200 g-cm ?
NO
Replace supply reel disk.
YES
Check main PWB.

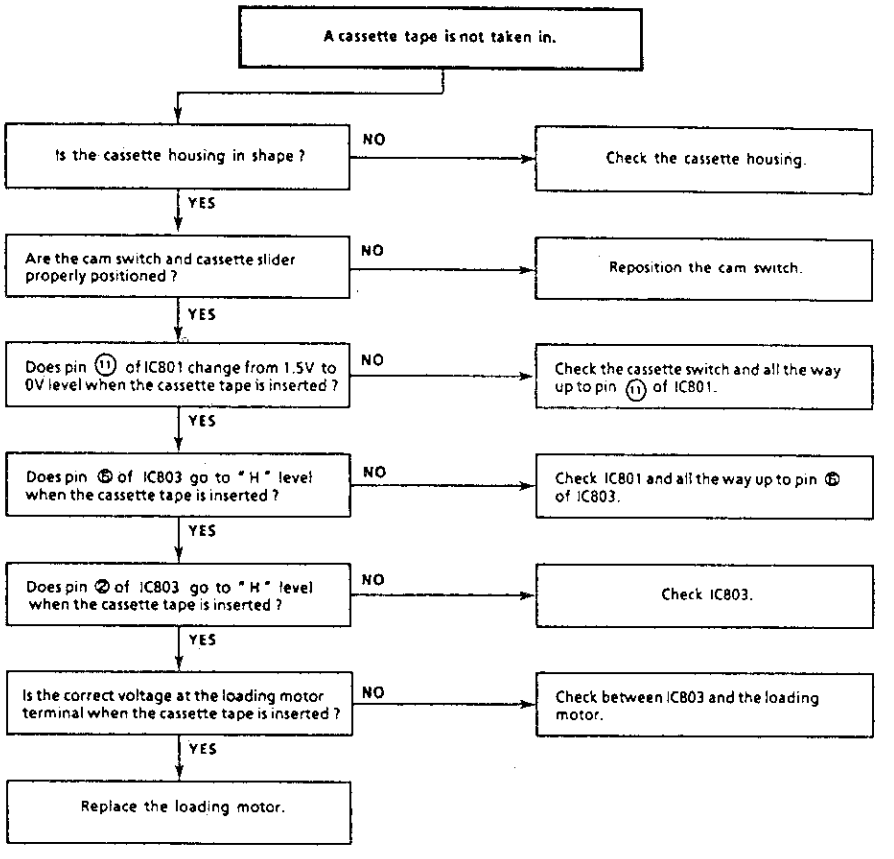
## POWER TROUBLESHOOTING

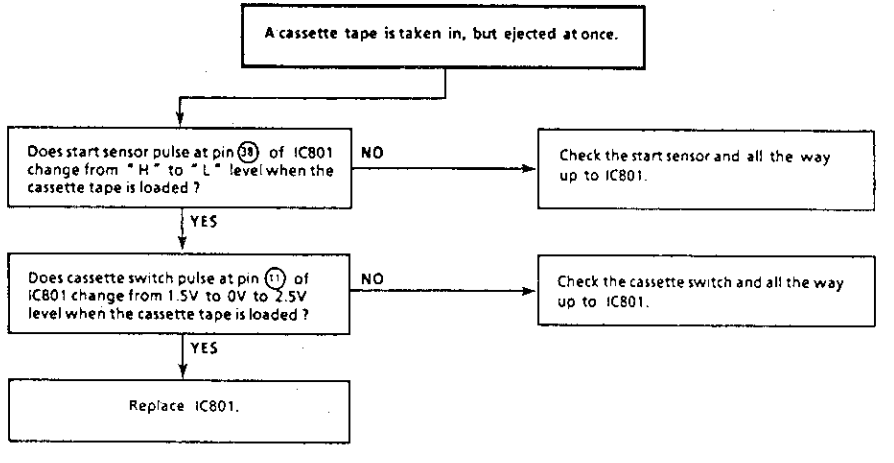
FLOW CHART NO. 1


The VCR is dead.
Unplug the AC power cord. Replug it a few minutes later.
Is the fuse alright ?
NO
Replace the fuse.
YES
Are the AT12V, AT9V, AT5V, AT45V, AT – 30V and UR12V lines normal ?
NO
Check for short in the main PWB, fuse resistance and transistor trouble in the power unit, etc.
YES
Is the display tube illuminated ?
NO
Check the timer circuit.
YES
Are the AT5V and GND lines properly connected with IC801 ?
NO
Check the poor soldering.
YES
Is there oscillation at pins ㊻ and ㊼ of IC801 ?
NO
Replace IC801 and /or FL801.
YES
Does pin ⑲ of IC801 change from "H" to "L" level when the power is turned on ?
NO
Check pin ⑲ of IC801 or pin ⑮ of IC5001.

## CASSETTE CONTROL TROUBLESHOOTING

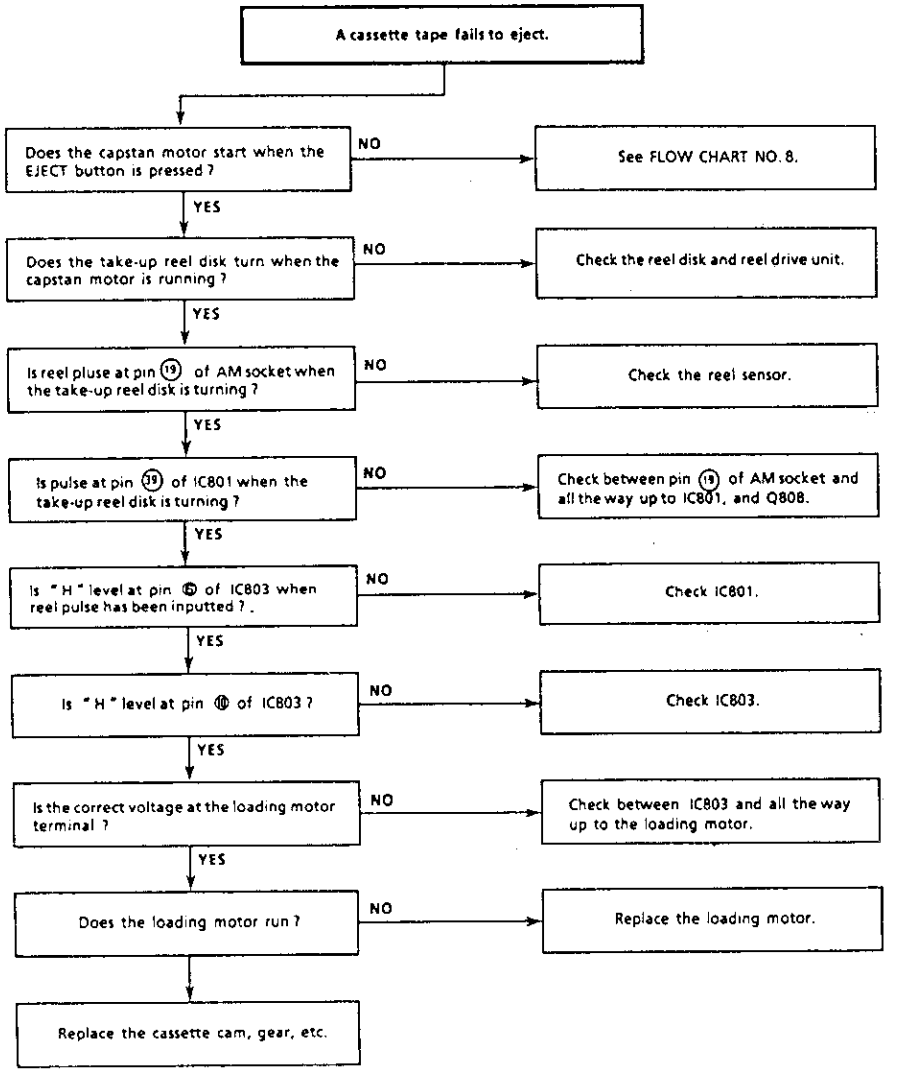
FLOW CHART NO. 2


A cassette tape is not taken in.
Is the cassette housing in shape ?
NO
Check the cassette housing.
YES
Are the cam switch and cassette slider properly positioned ?
NO
Reposition the cam switch.
YES
Does pin ⑪ of IC801 change from 1.5V to 0V level when the cassette tape is inserted ?
NO
Check the cassette switch and all the way up to pin ⑪ of IC801.
YES
Does pin ⑮ of IC803 go to "H" level when the cassette tape is inserted ?
NO
Check IC801 and all the way up to pin ⑮ of IC803.
YES
Does pin ② of IC803 go to "H" level when the cassette tape is inserted ?
NO
Check IC803.
YES
Is the correct voltage at the loading motor terminal when the cassette tape is inserted ?
NO
Check between IC803 and the loading motor.
YES
Replace the loading motor.


A cassette tape is taken in, but ejected at once.
Does start sensor pulse at pin ㊳ of IC801 change from "H" to "L" level when the cassette tape is loaded ?
NO
Check the start sensor and all the way up to IC801.
YES
Does cassette switch pulse at pin ⑪ of IC801 change from 1.5V to 0V to 2.5V level when the cassette tape is loaded ?
NO
Check the cassette switch and all the way up to IC801.
YES
Replace IC801.

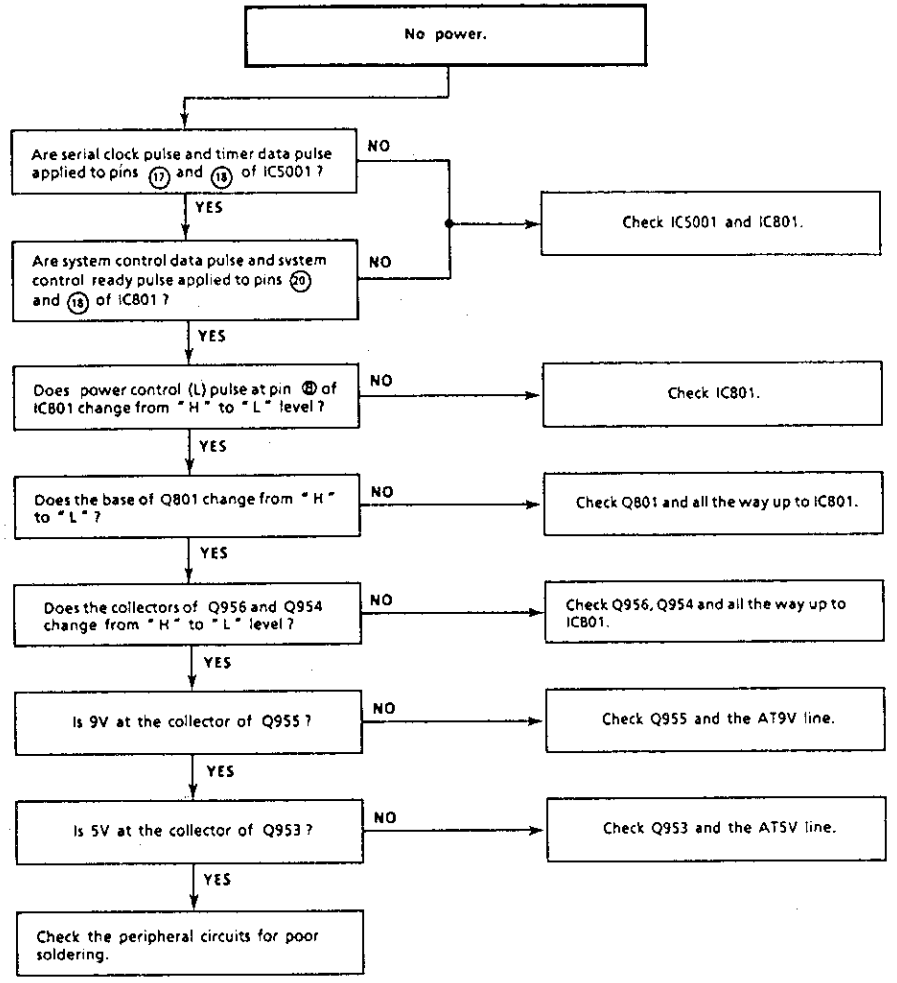
## LOADING MOTOR AND EJECT TROUBLESHOOTING

FLOW CHART NO. 3


A cassette tape fails to eject.
Does the capstan motor start when the EJECT button is pressed ?
NO
See FLOW CHART NO. 8.
YES
Does the take-up reel disk turn when the capstan motor is running ?
NO
Check the reel disk and reel drive unit.
YES
Is reel pluse at pin (19) of AM socket when the take-up reel disk is turning ?
NO
Check the reel sensor.
YES
Is pulse at pin (39) of IC801 when the take-up reel disk is turning ?
NO
Check between pin (19) of AM socket and all the way up to IC801, and Q808.
YES
Is " H " level at pin (5) of IC803 when reel pulse has been inputted ? .
NO
Check IC801.
YES
Is " H " level at pin (10) of IC803 ?
NO
Check IC803.
YES
Is the correct voltage at the loading motor terminal ?
NO
Check between IC803 and all the way up to the loading motor.
YES
Does the loading motor run ?
NO
Replace the loading motor.
Replace the cassette cam, gear, etc.

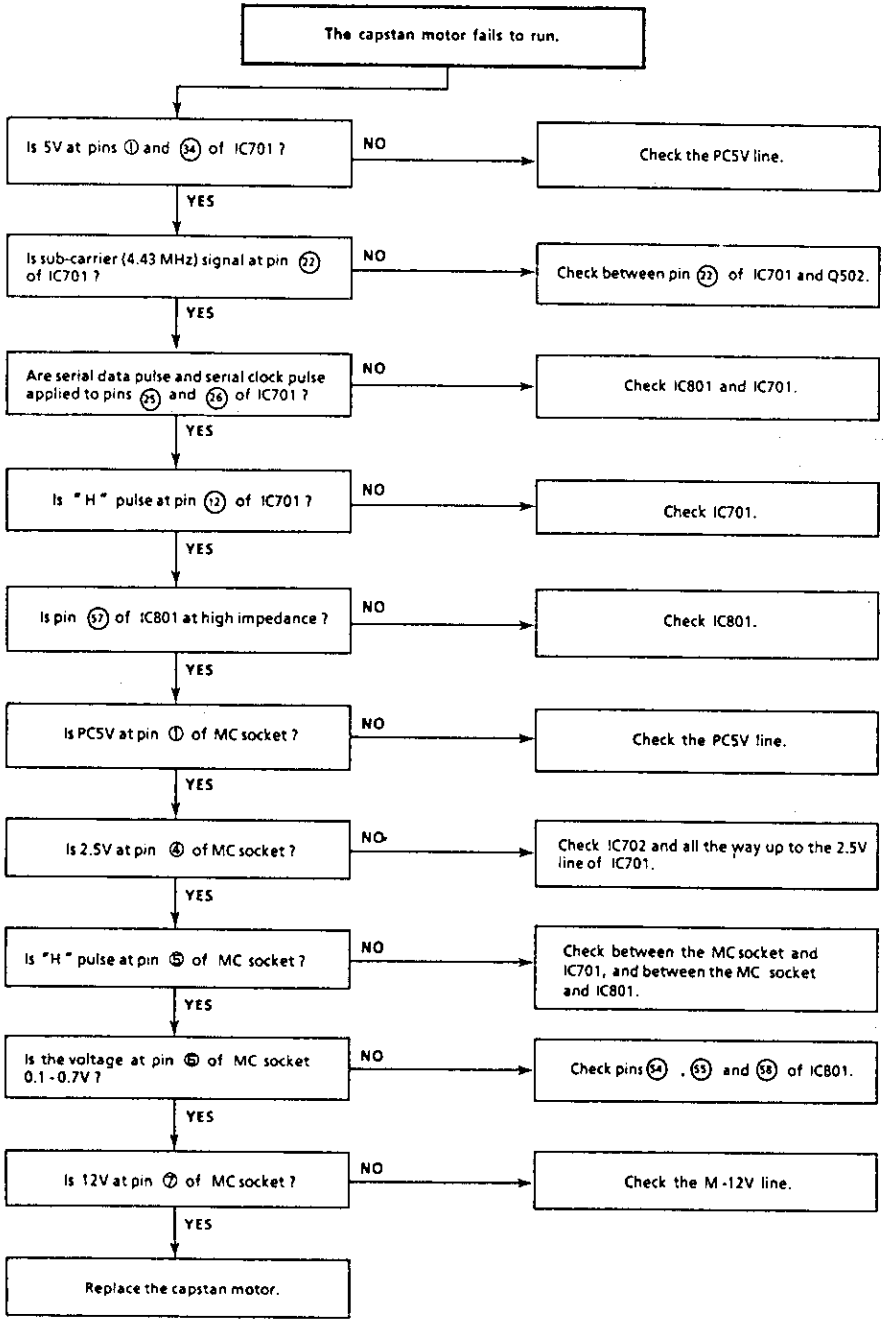
## SYSTEM CONTROL TROUBLESHOOTING

FLOW CHART NO. 4


No power.
Are serial clock pulse and timer data pulse applied to pins (17) and (18) of IC5001 ?
NO
YES
Are system control data pulse and system control ready pulse applied to pins (20) and (18) of IC801 ?
NO
Check IC5001 and IC801.
YES
Does power control (L) pulse at pin (8) of IC801 change from " H " to " L " level ?
NO
Check IC801.
YES
Does the base of Q801 change from " H " to " L " ?
NO
Check Q801 and all the way up to IC801.
YES
Does the collectors of Q956 and Q954 change from " H " to " L " level ?
NO
Check Q956, Q954 and all the way up to IC801.
YES
Is 9V at the collector of Q955 ?
NO
Check Q955 and the AT9V line.
YES
Is 5V at the collector of Q953 ?
NO
Check Q953 and the AT5V line.
YES
Check the peripheral circuits for poor soldering.

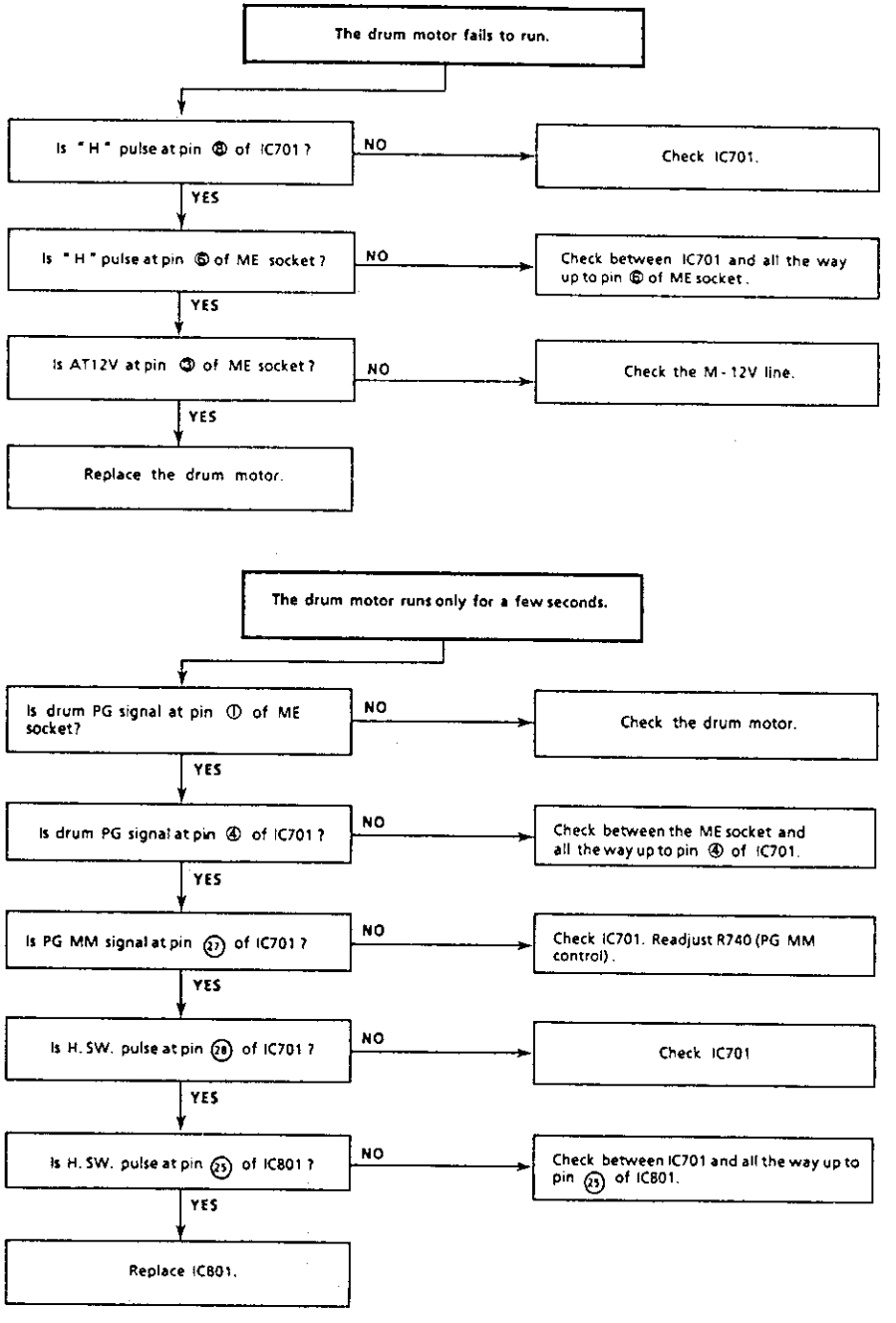
## CAPSTAN MOTOR TROUBLESHOOTING

FLOW CHART NO. 5


The capstan motor fails to run.
Is 5V at pins ① and ㉞ of IC701 ?
NO
Check the PC5V line.
YES
Is sub-carrier (4.43 MHz) signal at pin ㉒ of IC701 ?
NO
Check between pin ㉒ of IC701 and Q502.
YES
Are serial data pulse and serial clock pulse applied to pins ㉕ and ㉖ of IC701 ?
NO
Check IC801 and IC701.
YES
Is "H" pulse at pin ⑫ of IC701 ?
NO
Check IC701.
YES
Is pin ㊼ of IC801 at high impedance ?
NO
Check IC801.
YES
Is PC5V at pin ① of MC socket ?
NO
Check the PC5V line.
YES
Is 2.5V at pin ④ of MC socket ?
NO
Check IC702 and all the way up to the 2.5V line of IC701.
YES
Is "H" pulse at pin ⑤ of MC socket ?
NO
Check between the MC socket and IC701, and between the MC socket and IC801.
YES
Is the voltage at pin ⑥ of MC socket 0.1 - 0.7V ?
NO
Check pins ㊹ , ㊺ and ㊽ of IC801.
YES
Is 12V at pin ⑦ of MC socket ?
NO
Check the M-12V line.
YES
Replace the capstan motor.

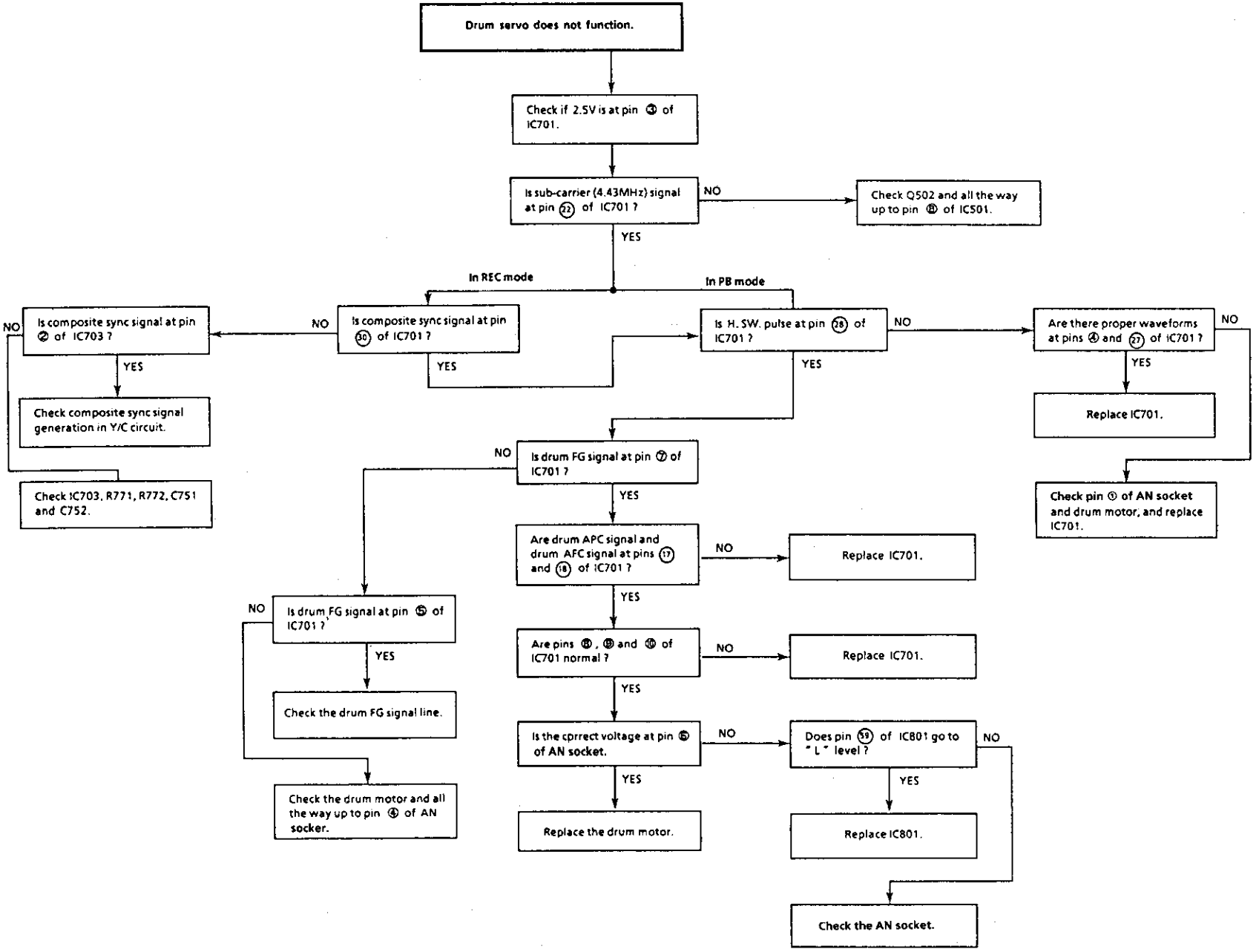
## DRUM MOTOR TROUBLESHOOTING

FLOW CHART NO. 6


The drum motor fails to run.
Is "H" pulse at pin ⑧ of IC701 ?
NO
Check IC701.
YES
Is "H" pulse at pin ⑥ of ME socket ?
NO
Check between IC701 and all the way up to pin ⑥ of ME socket.
YES
Is AT12V at pin ③ of ME socket ?
NO
Check the M-12V line.
YES
Replace the drum motor.
The drum motor runs only for a few seconds.
Is drum PG signal at pin ① of ME socket?
NO
Check the drum motor.
YES
Is drum PG signal at pin ④ of IC701 ?
NO
Check between the ME socket and all the way up to pin ④ of IC701.
YES
Is PG MM signal at pin ㉗ of IC701 ?
NO
Check IC701. Readjust R740 (PG MM control).
YES
Is H. SW. pulse at pin ㉘ of IC701 ?
NO
Check IC701
YES
Is H. SW. pulse at pin ㉓ of IC801 ?
NO
Check between IC701 and all the way up to pin ㉓ of IC801.
YES
Replace IC801.

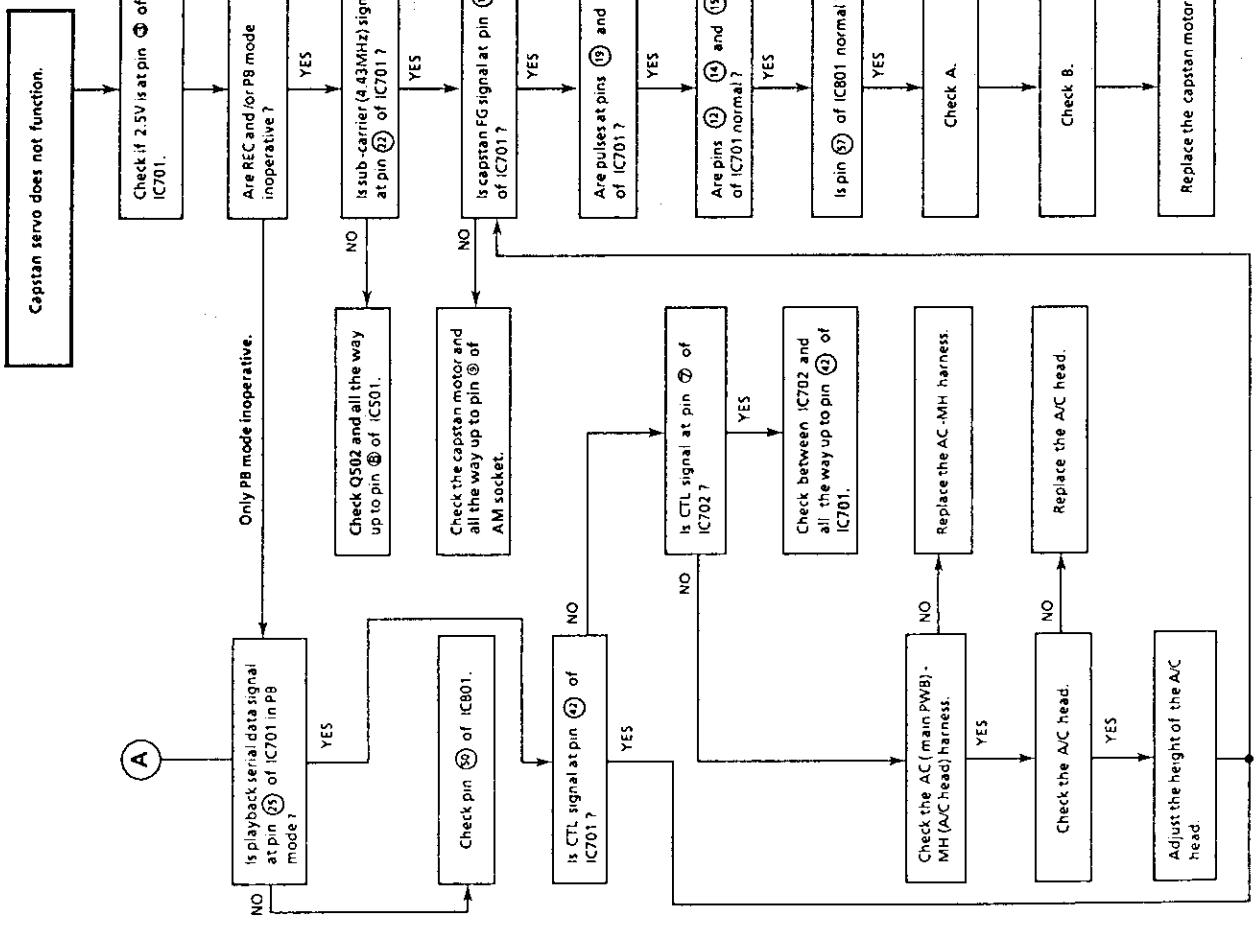
## DRUM SERVO TROUBLESHOOTING

FLOW CHART NO. 7


Drum servo does not function.
Check if 2.5V is at pin ㉓ of IC701.
Is sub-carrier (4.43MHz) signal at pin (22) of IC701 ?
NO
Check Q502 and all the way up to pin ⑧ of IC501.
YES
In REC mode
In PB mode
Is composite sync signal at pin ② of IC703 ?
NO
YES
Check composite sync signal generation in Y/C circuit.
NO
Check IC703, R771, R772, C751 and C752.
Is composite sync signal at pin (50) of IC701 ?
NO
YES
Is H. SW. pulse at pin (28) of IC701 ?
NO
YES
Are there proper waveforms at pins ④ and (27) of IC701 ?
NO
YES
Replace IC701.
Check pin ① of AN socket and drum motor, and replace IC701.
Is drum FG signal at pin ⑦ of IC701 ?
NO
YES
Are drum APC signal and drum AFC signal at pins (17) and (18) of IC701 ?
NO
Replace IC701.
YES
Are pins ⑧, ⑨ and ⑩ of IC701 normal ?
NO
Replace IC701.
YES
Is the cprrect voltage at pin ⑮ of AN socket.
NO
Does pin (59) of IC801 go to "L" level ?
NO
YES
Replace IC801.
Check the AN socket.
YES
Replace the drum motor.
Is drum FG signal at pin ⑮ of IC701 ?
NO
YES
Check the drum FG signal line.
Check the drum motor and all the way up to pin ④ of AN socker.

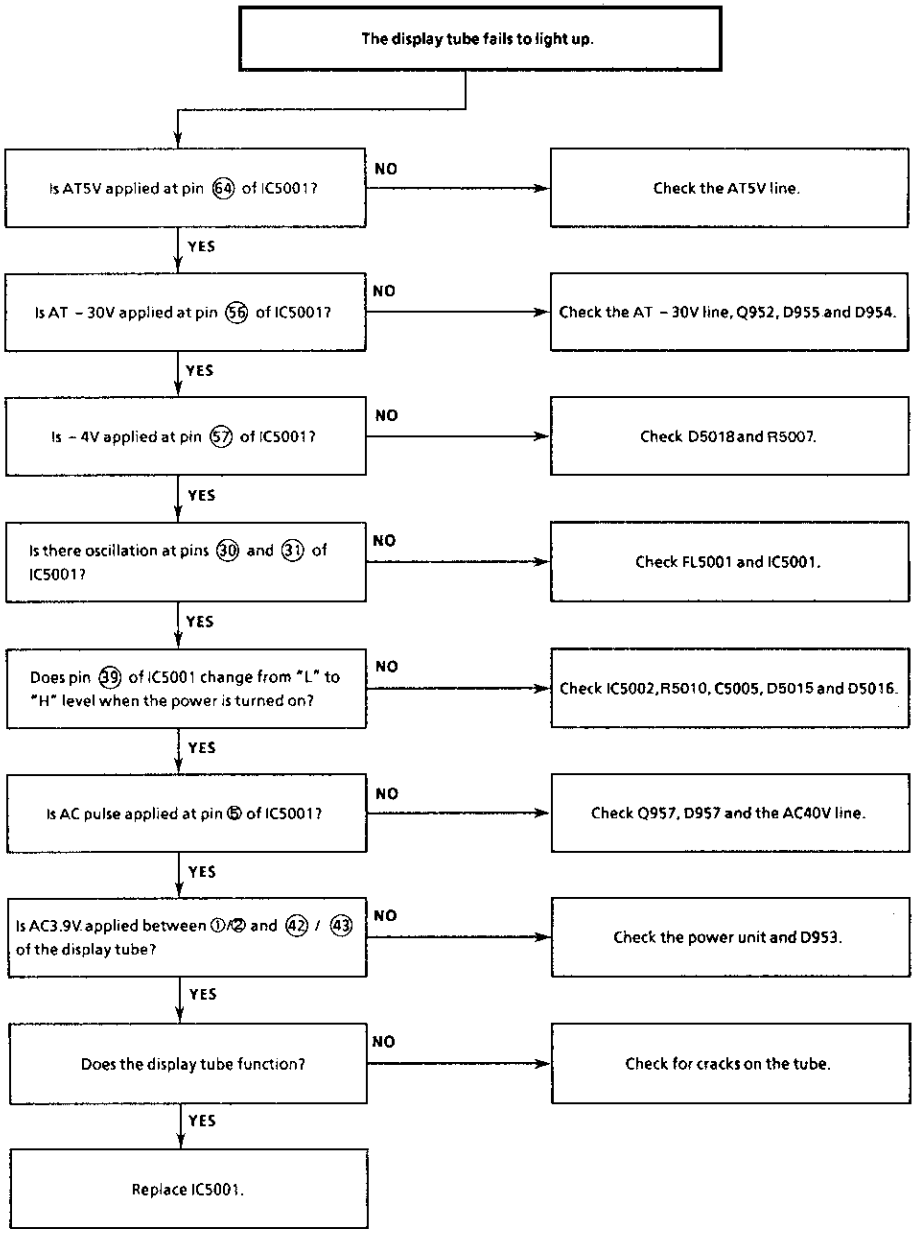
FLOW CHART NO. 8

## CAPSTAN SERVO TROUBLESHOOTING


Capstan servo does not function.
Check if 2.5V is at pin ㉔ of IC701.
Are REC and/or PB mode inoperative ?
YES
NO
Only REC mode inoperative.
Only PB mode inoperative.
Is sub-carrier (4.43MHz) signal at pin ㉒ of IC701 ?
YES
NO
Check Q502 and all the way up to pin ㉔ of IC501.
Is capstan FG signal at pin ⑪ of IC701 ?
YES
NO
Check the capstan motor and all the way up to pin ⑥ of AM socket.
Are pulses at pins ⑲ and ㉑ of IC701 ?
YES
NO
Replace IC701.
Are pins ⑫ ⑭ and ⑮ of IC701 normal ?
YES
NO
Replace IC701.
Is pin ㊲ of IC801 normal ?
YES
NO
Replace IC801.
Check A.
Check B.
Replace the capstan motor.
Ⓐ
Is playback serial data signal at pin ㉕ of IC701 in PB mode ?
YES
NO
Check pin ㊵ of IC801.
Is CTL signal at pin ㊷ of IC701 ?
YES
NO
Is CTL signal at pin ⑦ of IC702 ?
YES
NO
Check between IC702 and all the way up to pin ㊷ of IC701.
Check the AC (main PWB) - MH (A/C head) harness.
YES
NO
Replace the AC-MH harness.
Check the A/C head.
YES
NO
Replace the A/C head.
Adjust the height of the A/C head.
Ⓑ
Is recording serial data signal at pin ㉕ of IC701 in REC mode ?
YES
NO
Are H. SW. pulse and composite sync signal at pins ㉘ and ㊵ of IC701 ?
YES
NO
Are CTL signals at pins ㊻ and ㊼ of IC701 ?
YES
NO
Check the H. SW. pulse and composite sync signal lines.
Check pin ㊵ of IC801.

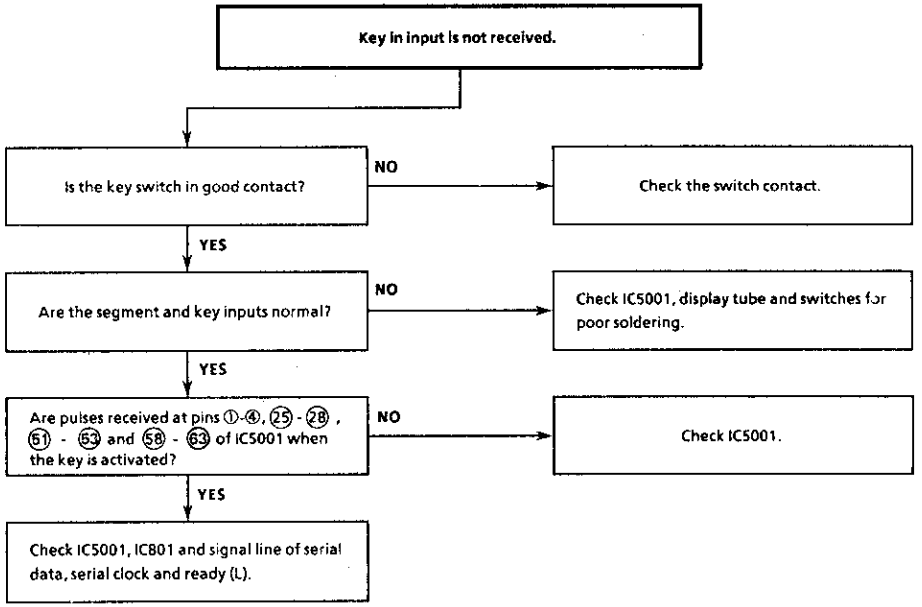
## TIMER (1) TROUBLESHOOTING

FLOW CHART NO. 9


The display tube fails to light up.
Is AT5V applied at pin (64) of IC5001?
NO
Check the AT5V line.
YES
Is AT – 30V applied at pin (56) of IC5001?
NO
Check the AT – 30V line, Q952, D955 and D954.
YES
Is – 4V applied at pin (57) of IC5001?
NO
Check D5018 and R5007.
YES
Is there oscillation at pins (30) and (31) of IC5001?
NO
Check FL5001 and IC5001.
YES
Does pin (39) of IC5001 change from "L" to "H" level when the power is turned on?
NO
Check IC5002, R5010, C5005, D5015 and D5016.
YES
Is AC pulse applied at pin (5) of IC5001?
NO
Check Q957, D957 and the AC40V line.
YES
Is AC3.9V applied between ①/② and (42) / (43) of the display tube?
NO
Check the power unit and D953.
YES
Does the display tube function?
NO
Check for cracks on the tube.
YES
Replace IC5001.

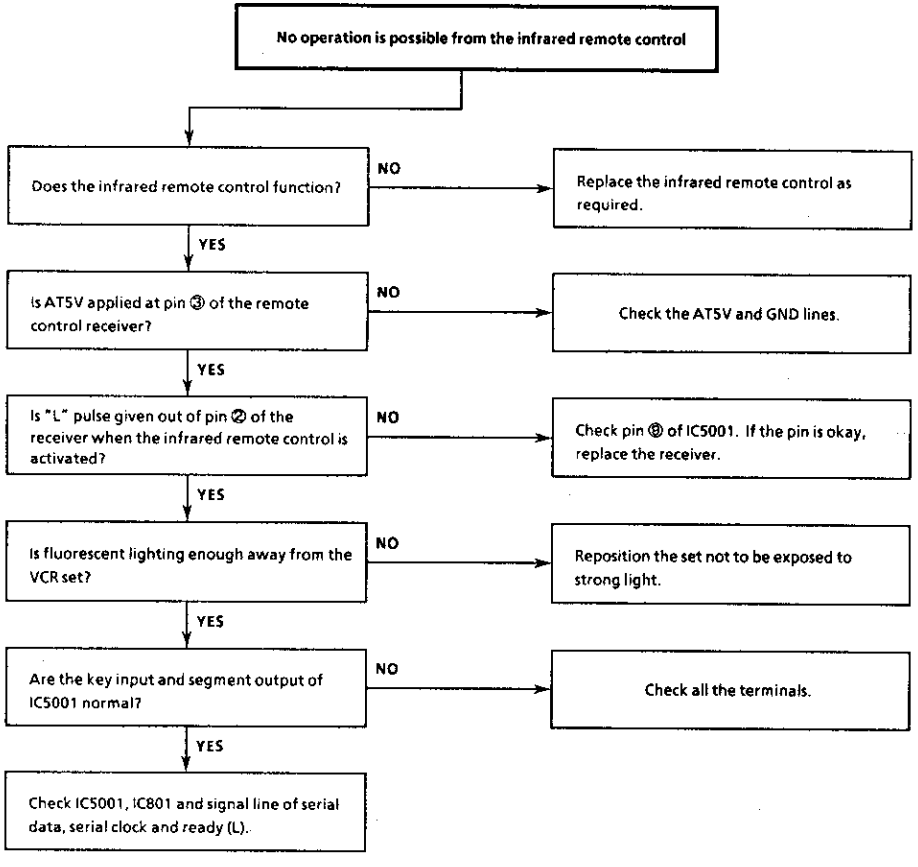
## TIMER (2) TROUBLESHOOTING

FLOW CHART NO. 10

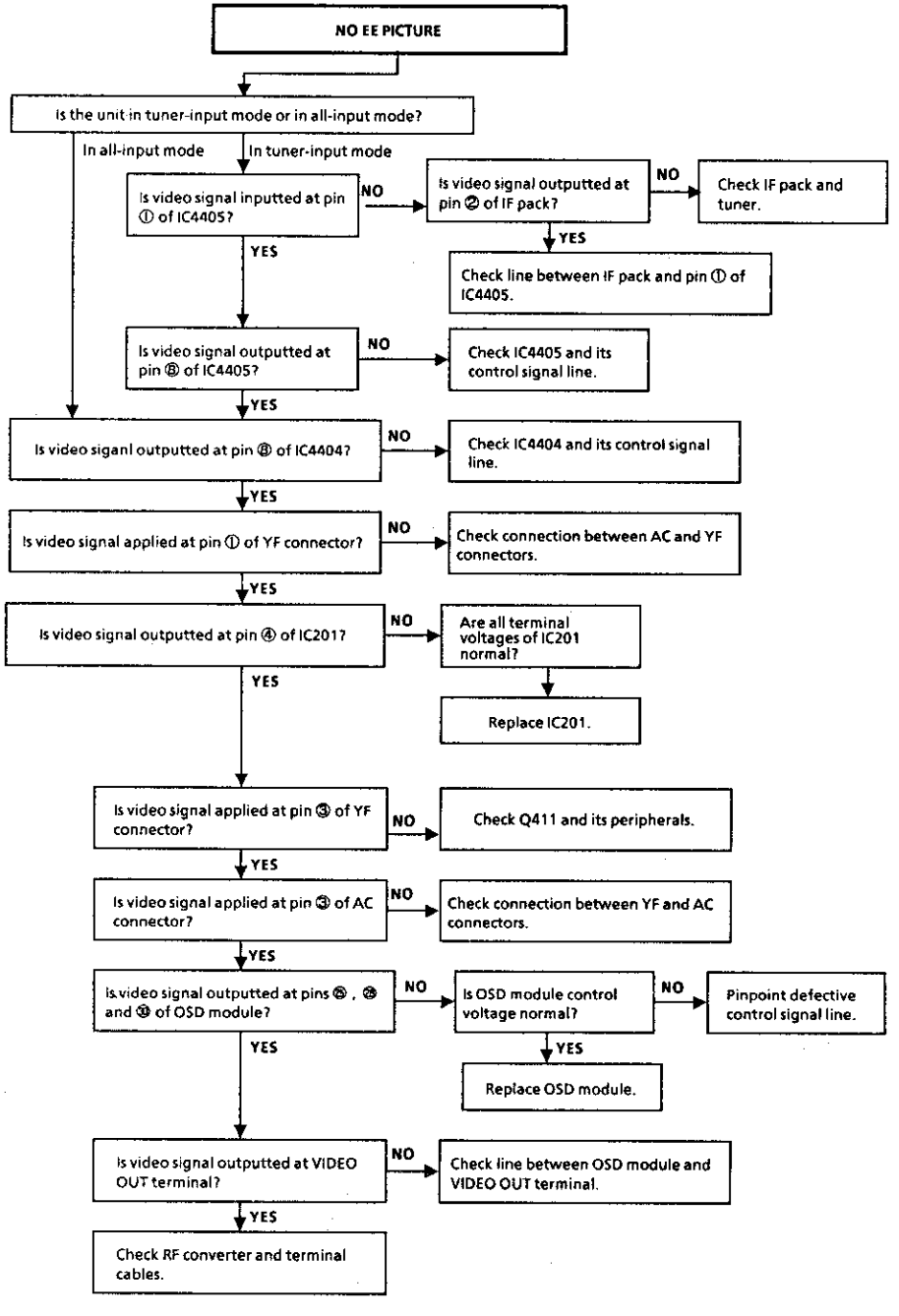

Key in input is not received.
Is the key switch in good contact?
NO
Check the switch contact.
YES
Are the segment and key inputs normal?
NO
Check IC5001, display tube and switches for poor soldering.
YES
Are pulses received at pins ①-④, (25) - (28), (51) - (53) and (58) - (63) of IC5001 when the key is activated?
NO
Check IC5001.
YES
Check IC5001, IC801 and signal line of serial data, serial clock and ready (L).

## INFRARED R/C TROUBLESHOOTING

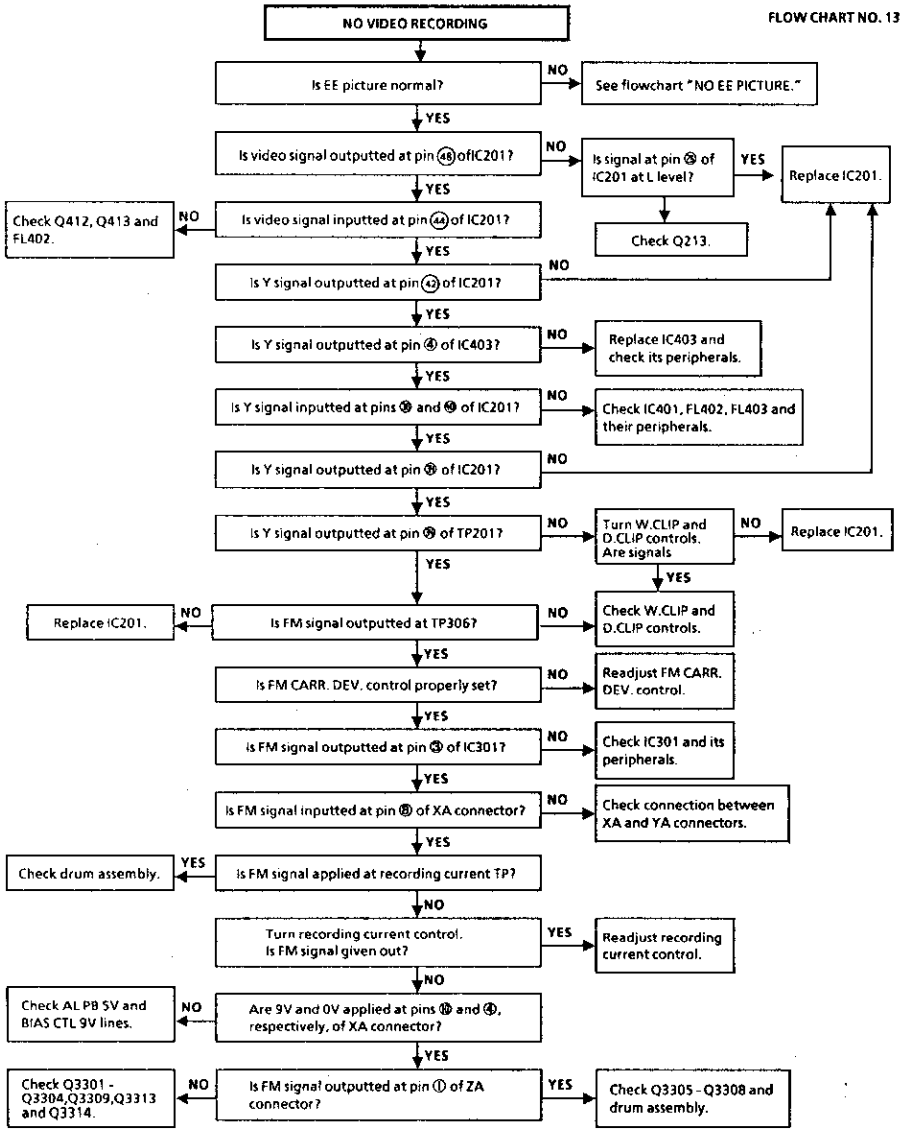
FLOW CHART NO. 11


No operation is possible from the infrared remote control
Does the infrared remote control function?
NO
Replace the infrared remote control as required.
YES
Is AT5V applied at pin ③ of the remote control receiver?
NO
Check the AT5V and GND lines.
YES
Is "L" pulse given out of pin ② of the receiver when the infrared remote control is activated?
NO
Check pin ⑧ of IC5001. If the pin is okay, replace the receiver.
YES
Is fluorescent lighting enough away from the VCR set?
NO
Reposition the set not to be exposed to strong light.
YES
Are the key input and segment output of IC5001 normal?
NO
Check all the terminals.
YES
Check IC5001, IC801 and signal line of serial data, serial clock and ready (L).

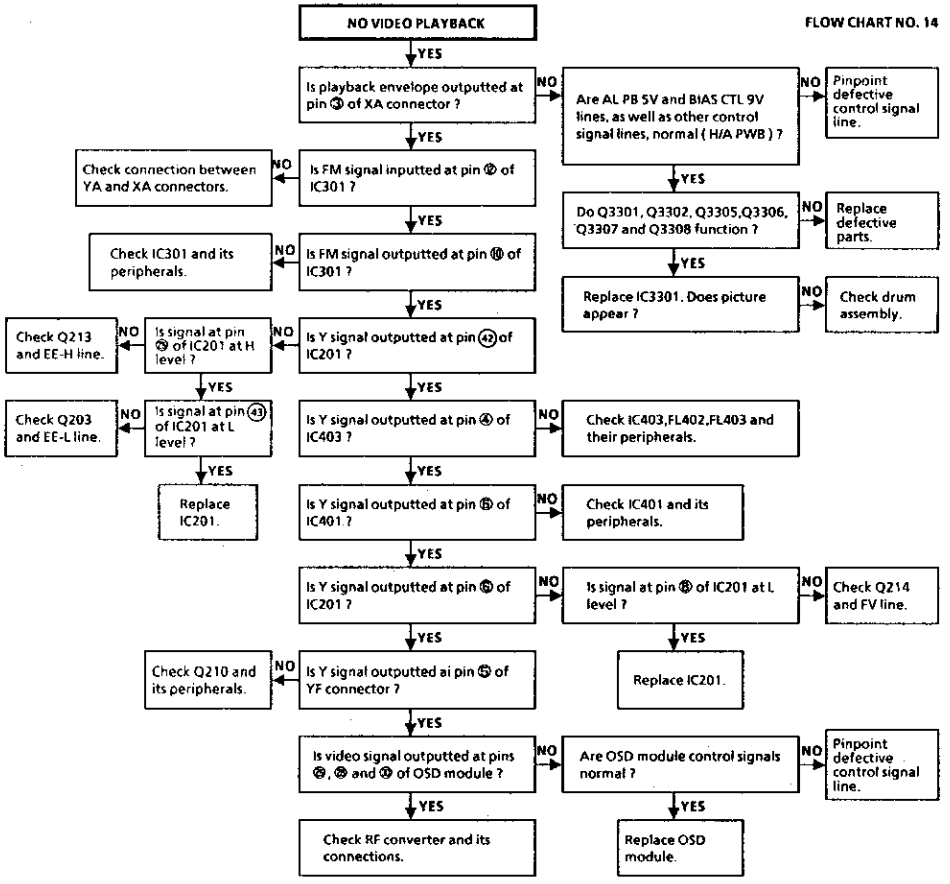
FLOW CHART NO. 12

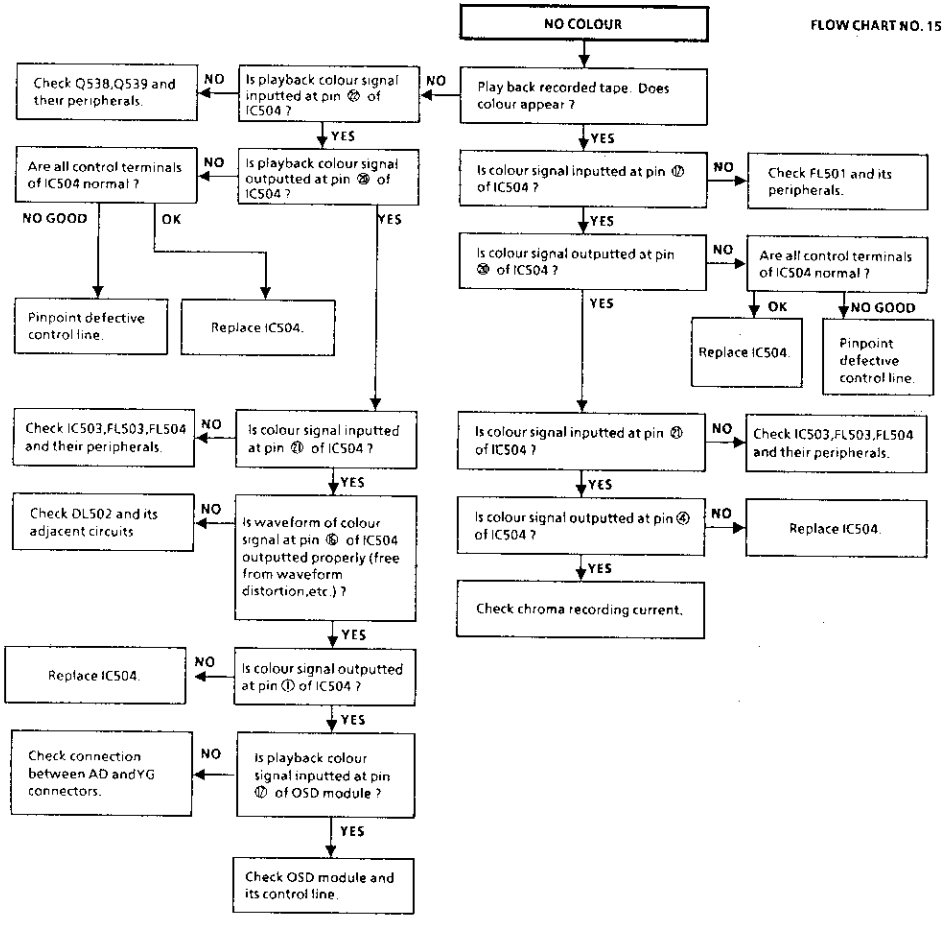

NO EE PICTURE
Is the unit in tuner-input mode or in all-input mode?
In all-input mode
In tuner-input mode
Is video signal inputted at pin ① of IC4405?
NO
Is video signal outputted at pin ② of IF pack?
NO
Check IF pack and tuner.
YES
Check line between IF pack and pin ① of IC4405.
YES
Is video signal outputted at pin ⑧ of IC4405?
NO
Check IC4405 and its control signal line.
YES
Is video siganl outputted at pin ⑧ of IC4404?
NO
Check IC4404 and its control signal line.
YES
Is video signal applied at pin ① of YF connector?
NO
Check connection between AC and YF connectors.
YES
Is video signal outputted at pin ④ of IC201?
NO
Are all terminal voltages of IC201 normal?
Replace IC201.
YES
Is video signal applied at pin ③ of YF connector?
NO
Check Q411 and its peripherals.
YES
Is video signal applied at pin ③ of AC connector?
NO
Check connection between YF and AC connectors.
YES
Is video signal outputted at pins ⑤, ⑳ and ㉑ of OSD module?
NO
Is OSD module control voltage normal?
NO
Pinpoint defective control signal line.
YES
Replace OSD module.
YES
Is video signal outputted at VIDEO OUT terminal?
NO
Check line between OSD module and VIDEO OUT terminal.
YES
Check RF converter and terminal cables.

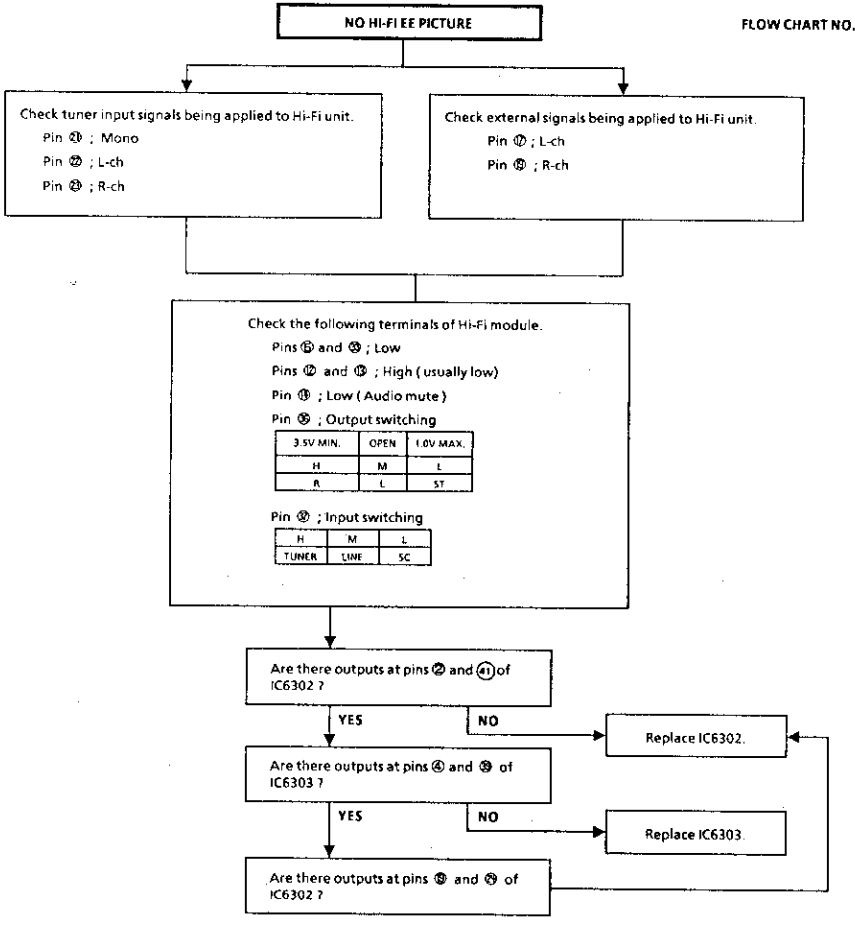
FLOW CHART NO. 13




FLOW CHART NO. 14


NO VIDEO PLAYBACK
YES
Is playback envelope outputted at pin ③ of XA connector ?
NO
Are AL PB 5V and BIAS CTL 9V lines, as well as other control signal lines, normal ( H/A PWB ) ?
NO
Pinpoint defective control signal line.
YES
Check connection between YA and XA connectors.
NO
Is FM signal inputted at pin ② of IC301 ?
YES
Do Q3301, Q3302, Q3305,Q3306, Q3307 and Q3308 function ?
NO
Replace defective parts.
YES
Check IC301 and its peripherals.
NO
Is FM signal outputted at pin ⑩ of IC301 ?
YES
Replace IC3301. Does picture appear ?
NO
Check drum assembly.
Check Q213 and EE-H line.
NO
Is signal at pin ㉘ of IC201 at H level ?
NO
Is Y signal outputted at pin (42) of IC201 ?
YES
YES
Check Q203 and EE-L line.
NO
Is signal at pin (43) of IC201 at L level ?
YES
Is Y signal outputted at pin ④ of IC403 ?
NO
Check IC403,FL402,FL403 and their peripherals.
YES
Replace IC201.
YES
Is Y signal outputted at pin ⑮ of IC401 ?
NO
Check IC401 and its peripherals.
YES
Is Y signal outputted at pin ⑮ of IC201 ?
NO
Is signal at pin ㉘ of IC201 at L level ?
NO
Check Q214 and FV line.
YES
YES
Check Q210 and its peripherals.
NO
Is Y signal outputted ai pin ⑮ of YF connector ?
Replace IC201.
YES
Is video signal outputted at pins ㉙, ㉘ and ㉗ of OSD module ?
NO
Are OSD module control signals normal ?
NO
Pinpoint defective control signal line.
YES
YES
Check RF converter and its connections.
Replace OSD module.


NO COLOUR
FLOW CHART NO. 15
Play back recorded tape. Does colour appear ?
NO
YES
Is playback colour signal inputted at pin ㉘ of IC504 ?
Check Q538,Q539 and their peripherals.
Is playback colour signal outputted at pin ㉘ of IC504 ?
Are all control terminals of IC504 normal ?
NO GOOD
OK
Pinpoint defective control line.
Replace IC504.
Is colour signal inputted at pin ⑰ of IC504 ?
Check FL501 and its peripherals.
Is colour signal outputted at pin ㉘ of IC504 ?
Are all control terminals of IC504 normal ?
Replace IC504.
Pinpoint defective control line.
Is colour signal inputted at pin ㉑ of IC504 ?
Check IC503,FL503,FL504 and their peripherals.
Is colour signal outputted at pin ④ of IC504 ?
Replace IC504.
Check chroma recording current.
Is waveform of colour signal at pin ⑮ of IC504 outputted properly (free from waveform distortion,etc.) ?
Check DL502 and its adjacent circuits
Is colour signal outputted at pin ① of IC504 ?
Replace IC504.
Is playback colour signal inputted at pin ⑰ of OSD module ?
Check connection between AD andYG connectors.
Check OSD module and its control line.


NO HI-FI EE PICTURE
FLOW CHART NO. 16
Check tuner input signals being applied to Hi-Fi unit.
Pin ⑳ ; Mono
Pin ㉒ ; L-ch
Pin ㉔ ; R-ch
Check external signals being applied to Hi-Fi unit.
Pin ⑰ ; L-ch
Pin ⑱ ; R-ch
Check the following terminals of Hi-Fi module.
Pins ⑮ and ㉘ ; Low
Pins ⑫ and ⑬ ; High ( usually low)
Pin ⑪ ; Low ( Audio mute )
Pin ㉙ ; Output switching
3.5V MIN. | OPEN | 1.0V MAX.
H | M | L
R | L | ST
Pin ㉚ ; Input switching
H | M | L
TUNER | LINE | SC
Are there outputs at pins ② and ㊶ of IC6302 ?
YES
NO
Replace IC6302.
Are there outputs at pins ④ and ㉙ of IC6303 ?
Replace IC6303.
Are there outputs at pins ⑨ and ㉙ of IC6302 ?

## NO HI-FI RECORDING

FLOW CHART NO. 17

Make sure there is EE audio output.

Check the following terminals of Hi-Fi module.

- Pin ② ; 9V
- Pin ③ ; Low
- Pins ⑤ and ⑨ ; Low
- Pin ⑥ ; H.SW.P.
- Pin ⑦ ; 4.43MHz
- Pin ⑩ ; 9.8V
- Pins ⑫ and ⑬ ; High ( usually low )
- Pin ⑭ ; Low

Is recording FM signal given at TP6305 and TP6306 ?

- NO → Replace IC6303.
- YES → Is recording FM signal given at pin ① of IC6304 ?

## NO HI-FI PLAYBACK

Make sure EE recording is possible.

Is playback envelope given at TP6305 and TP6306 ?

- NO → Check Hi-Fi head. Replace IC6304.
- YES → Are audio signals outputted at pins ④ and ⑧ of IC6303 ?
  - NO → Replace IC6303.
  - YES → Are audio signals inputted and outputted in the following ways ?
    - From pin ⑰ to pin ⑲ of IC6302
    - From pin ⑳ to pin ㉒ of IC6302
    - NO → Replace IC6302.

Check the following terminals of HI-Fi module.

- Pin ① ; High
- Pins ② and ③ ; Low
- Pins ⑤ and ⑨ ; High
- Pin ⑥ ; H.SW.P.
- Pin ⑦ ; 4.43 MHz
- Pin ⑩ ; 9.5V
- Pin ⑬ ; Low

## NO TUNING

FLOW CHART NO. 18

Set band selector to V or U position. Is symbol "CH" blinking ?

- NO → Is GND signal (VHF), 2.5V signal (UHF) applied at pin ⑮ of IC1401 ?
  - NO → Check and replace SW8102 and/or AU-HB harness as required.
  - YES → Unplug and replug AC power cord for rechecking.
    - NO → Replace IC1401.
    - YES → Is AT 31.6V applied at IC1406 ?
      - NO → Check pin ⑪ of AR plug.
        - → Replace R925 of power unit.
      - YES → Does PWM signal of base of Q1407 change ?
        - NO → Unplug and replug AC power cord for rechecking.
          - → Replace IC1401.
        - YES → Replace Q1407.
- YES → Does tuning voltage change ?
  - NO → Replace IC1402.
  - YES → Set band selector to center position. Can tuning voltage be stored in memory ?
    - NO → Replace IC1402.
    - YES → Is band switching output from timer IC normal ?

IC1404

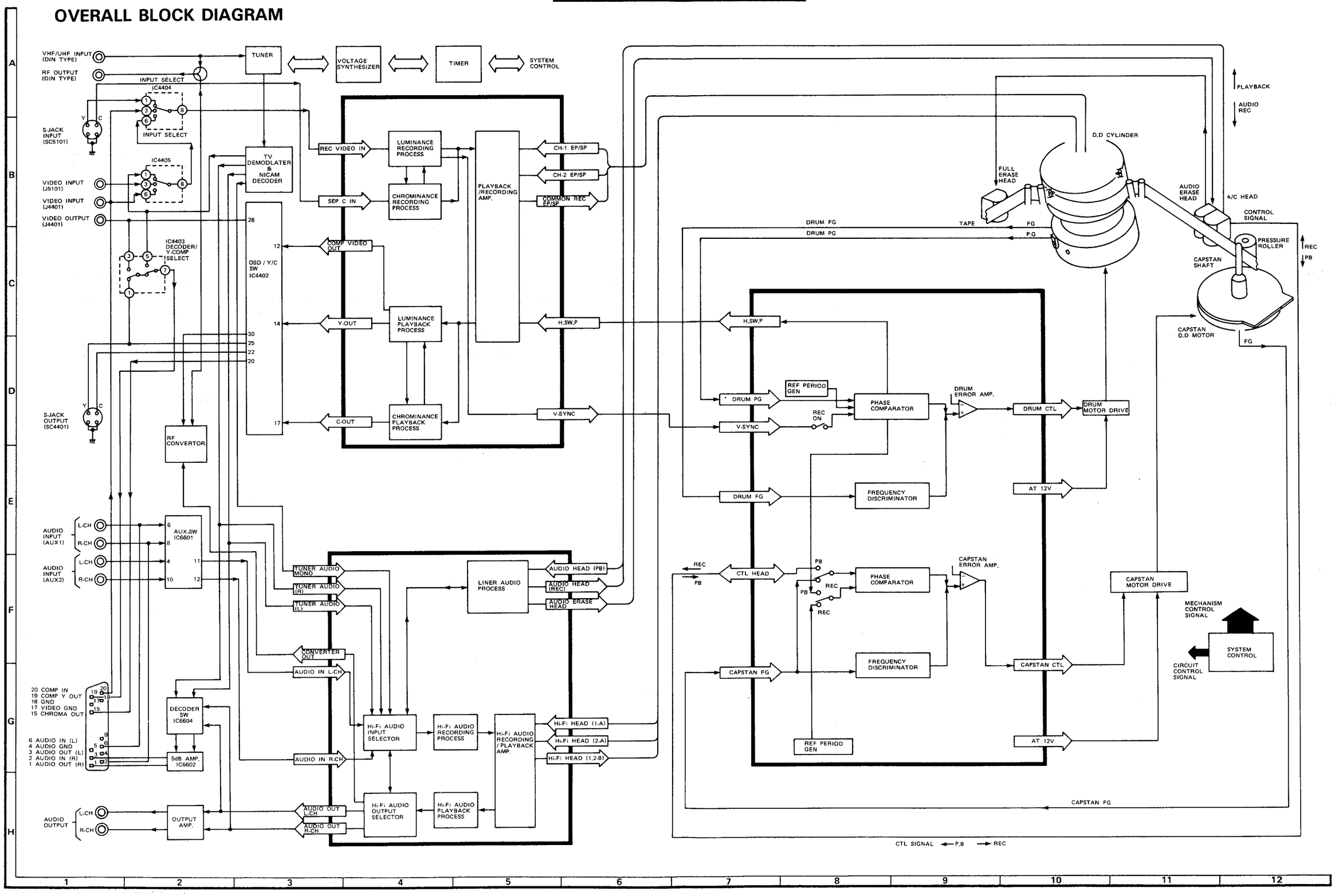
| BAND | B0 | B1 | OUT |
|---|---|---|---|
| VL | 0 | 0 | ① |
| VH | 5V | 0 | ② |
| VHYP | 0 | 5V | ⑦ |
| UHF | 5V | 5V | ⑧ |

Is IF output from tuner normal ?

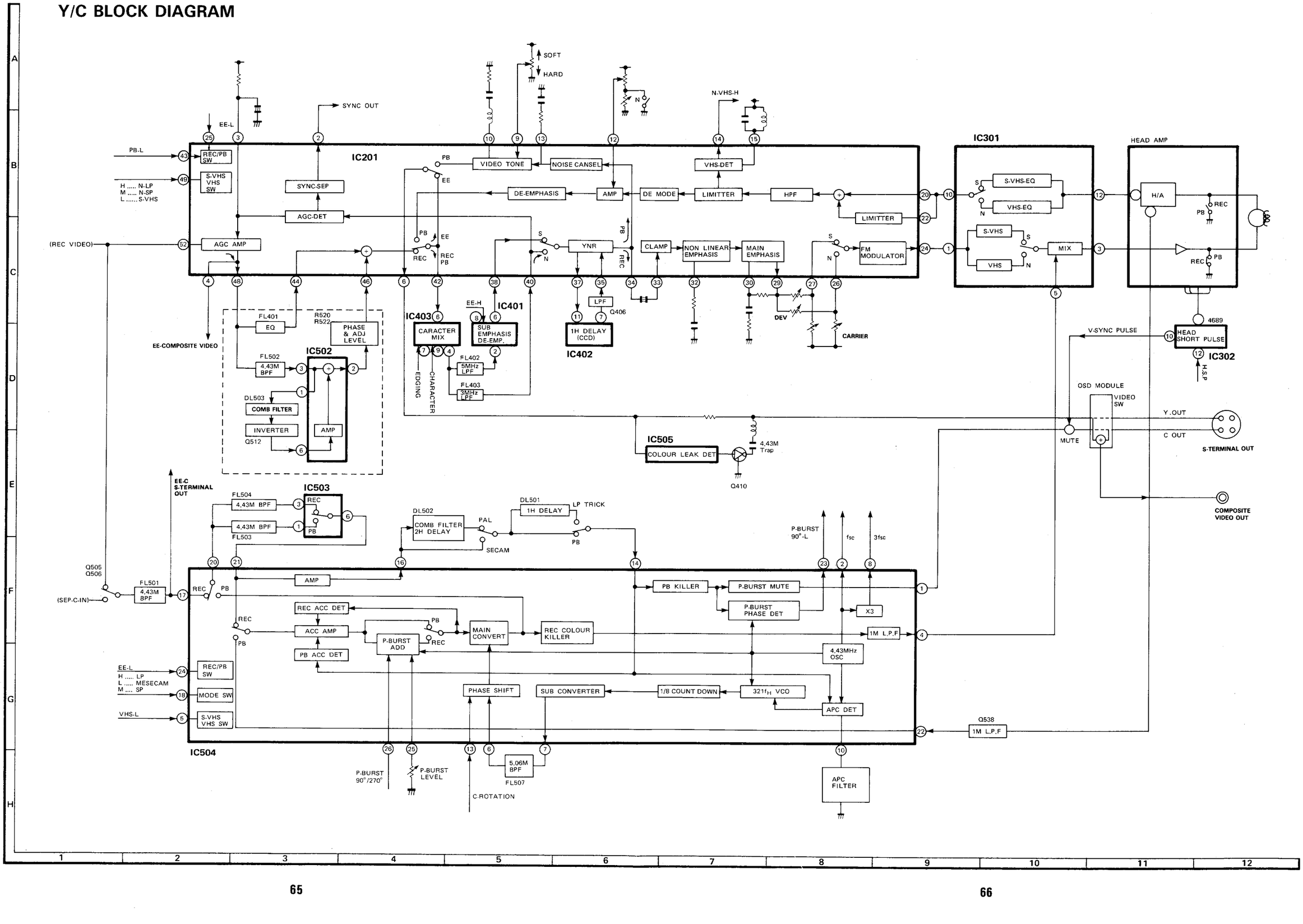
- ABNORMAL → Replace tuner.
- NORMAL → Is video signal outputted at pin ② of IF unit ?
  - NO → Replace IF unit.
  - YES → Is video signal outputted at pin ⑧ of IC4405 ?
    - NO → Replace IC4405.
    - YES → Is video signal outputted at pin ⑧ of IC4404 ?
      - NO → Replace IC4404.
      - YES → Is video signal outputted at pin ⑫ of IC4402 ?
        - NO → Check Y/C module.
        - YES → Is video signal outputted at pin ⑧ of IC4402 ?
          - NO → Check IC4402.
          - YES → Replace IC4403.

# —MEMO—

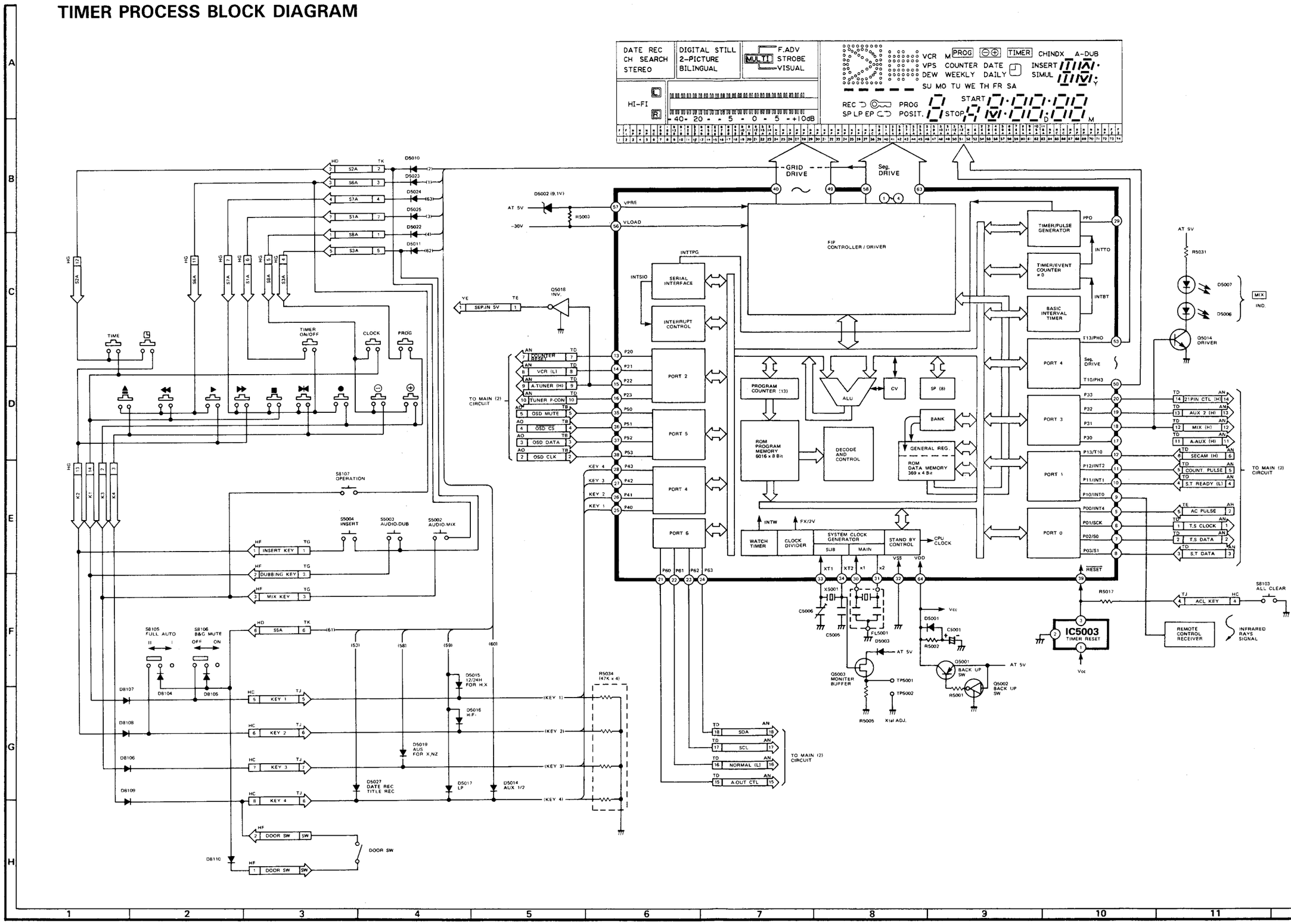
# OVERALL BLOCK DIAGRAM



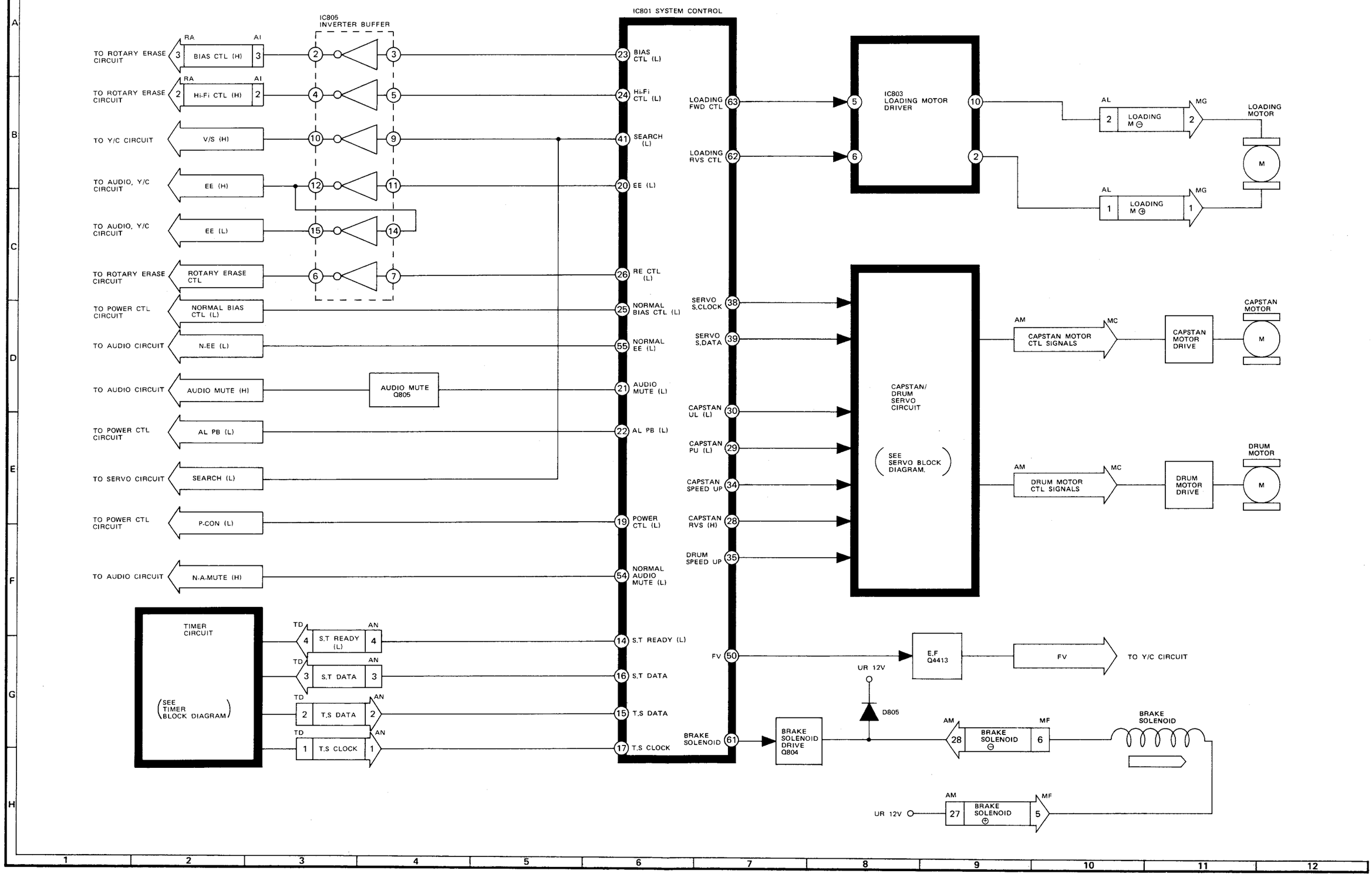
# Y/C BLOCK DIAGRAM



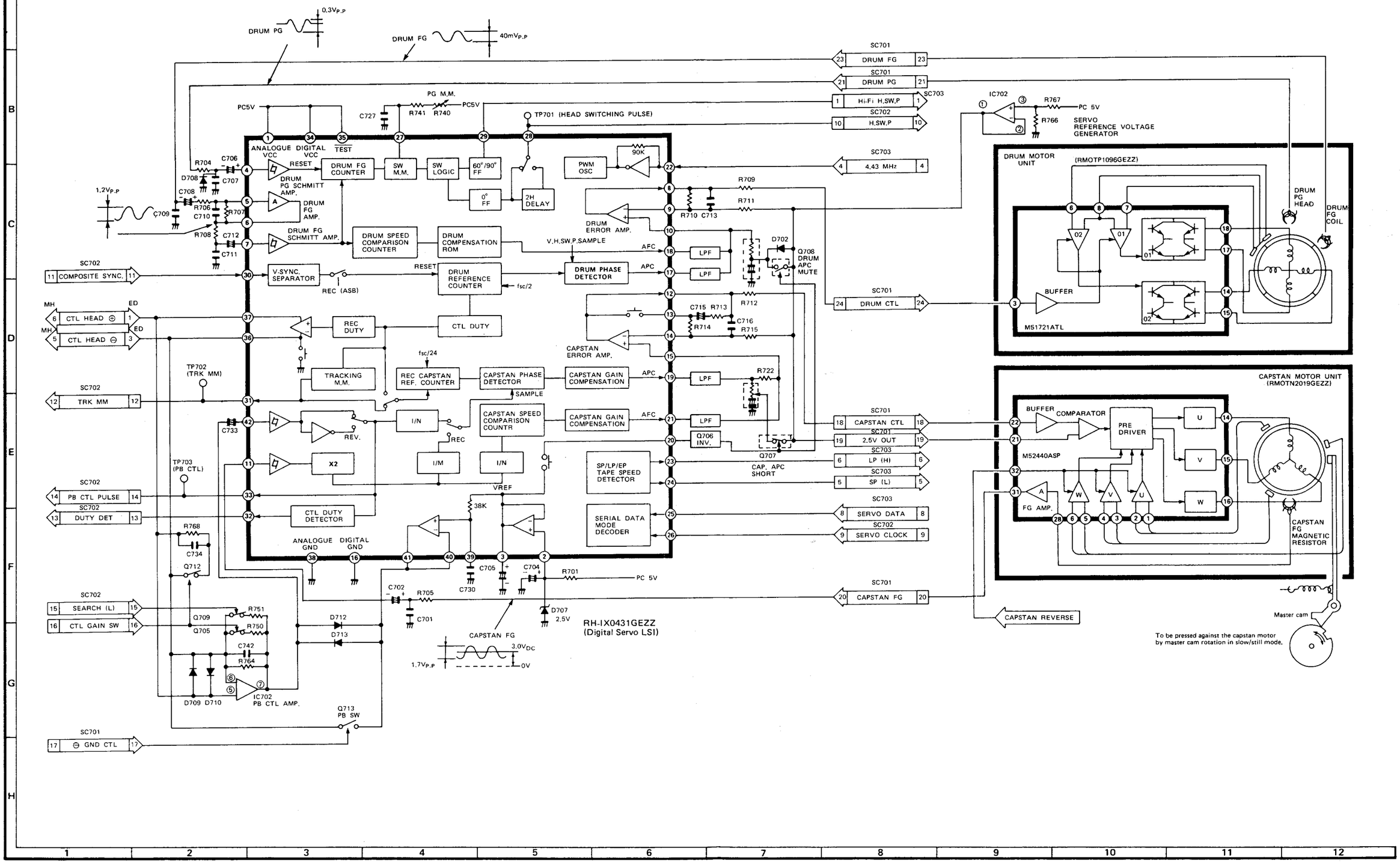
# TIMER PROCESS BLOCK DIAGRAM



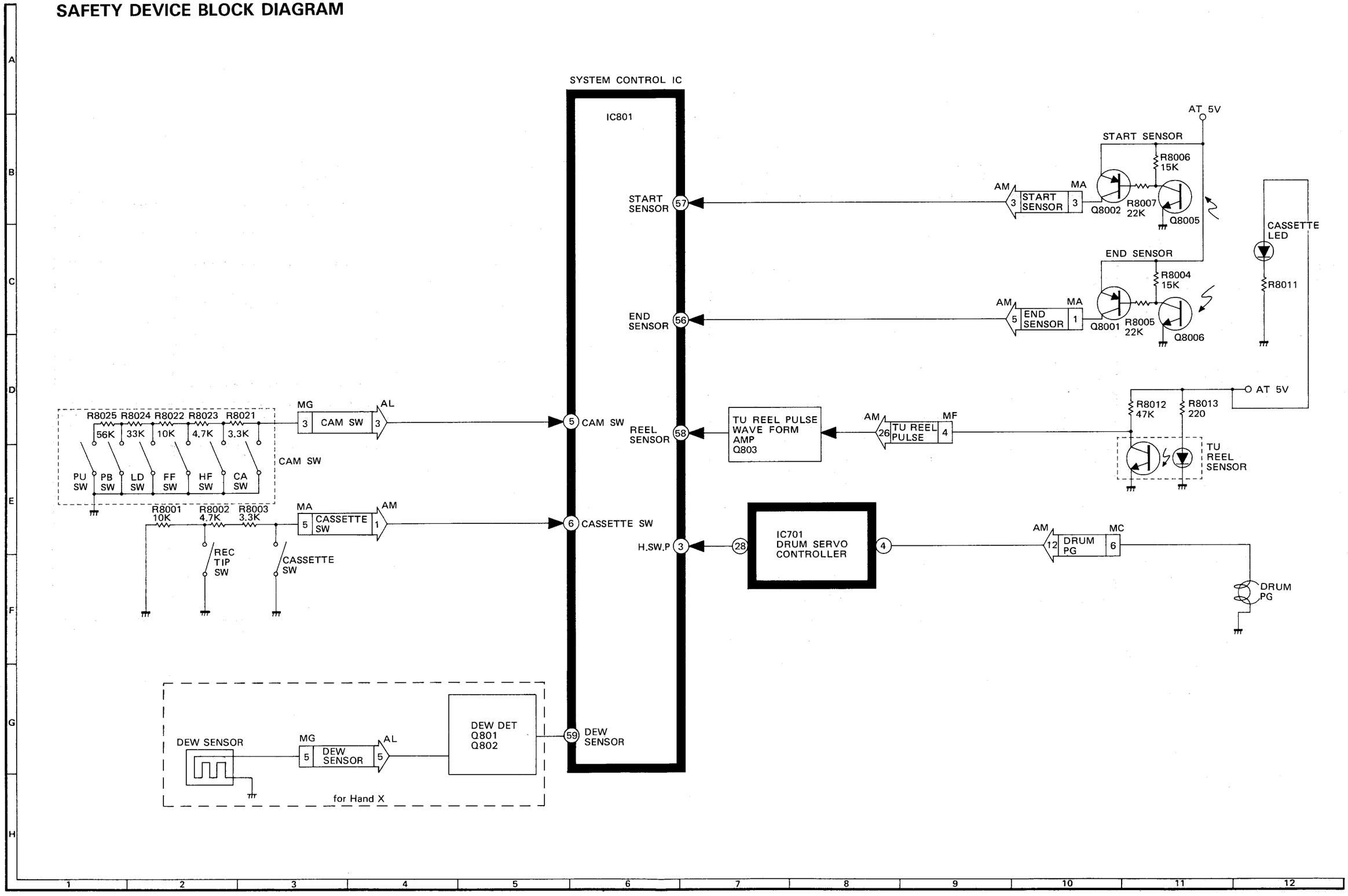
# SYSTEM CONTROL BLOCK DIAGRAM



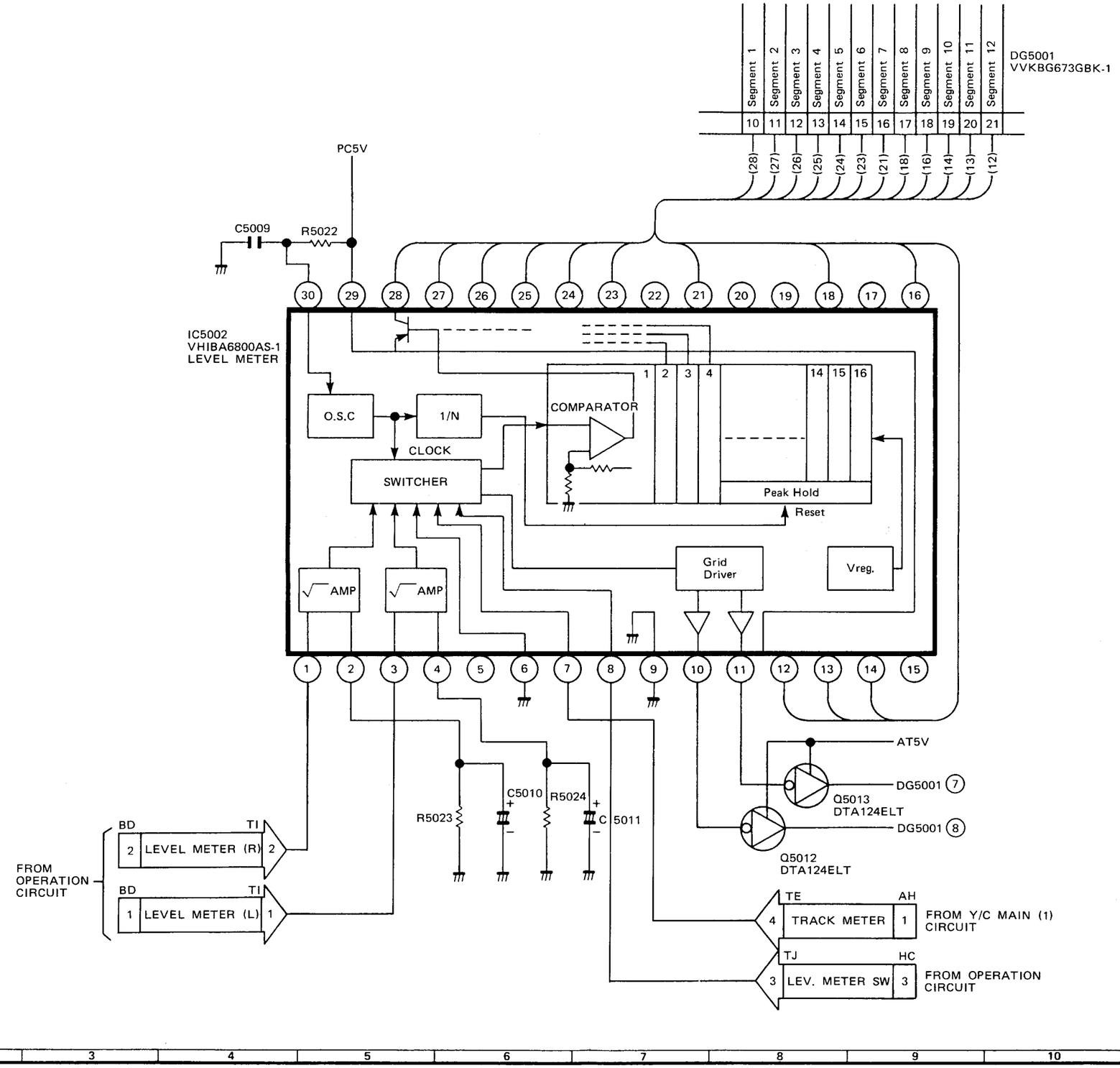
## SERVO BLOCK DIAGRAM



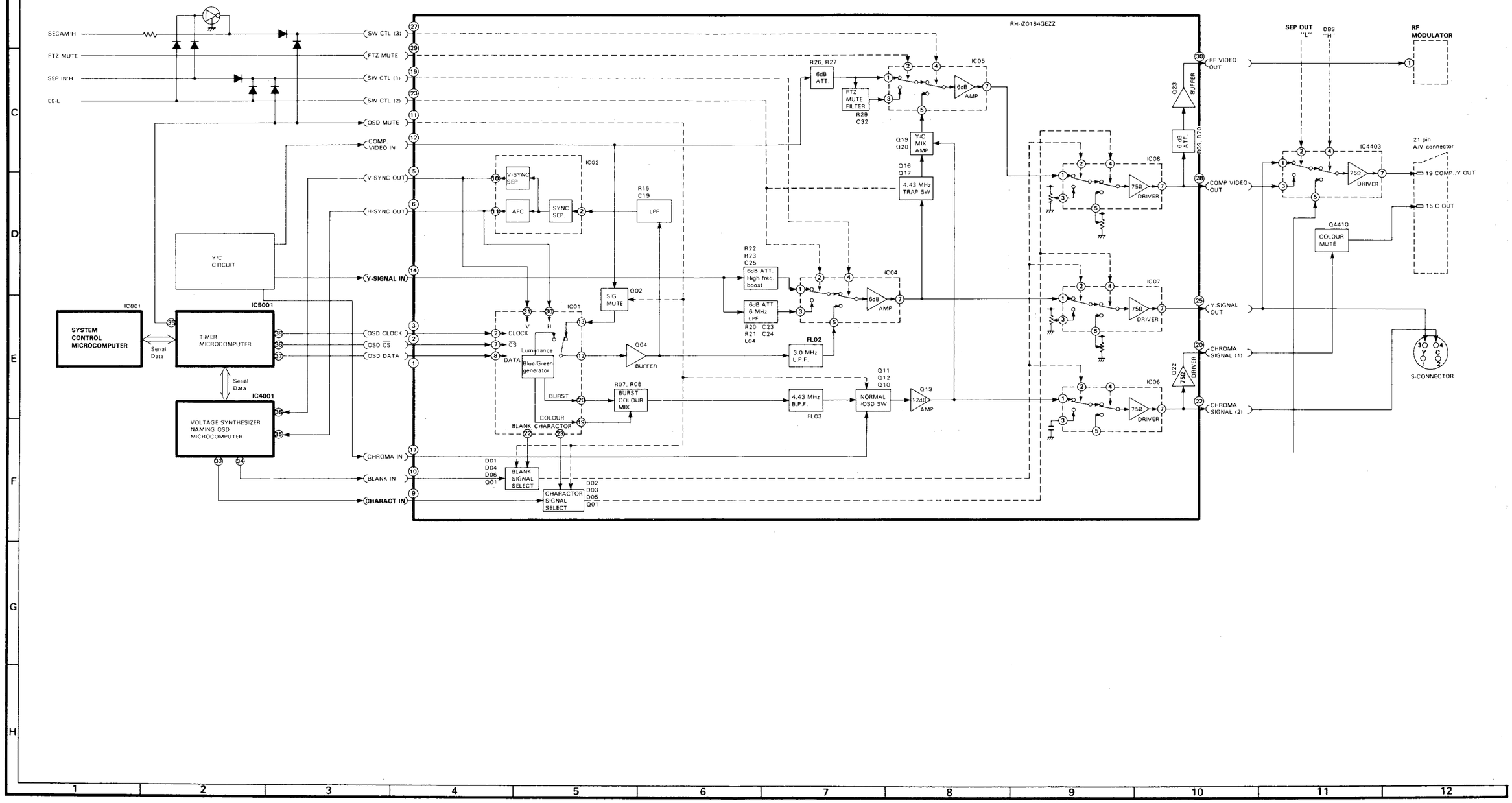
## SAFETY DEVICE BLOCK DIAGRAM



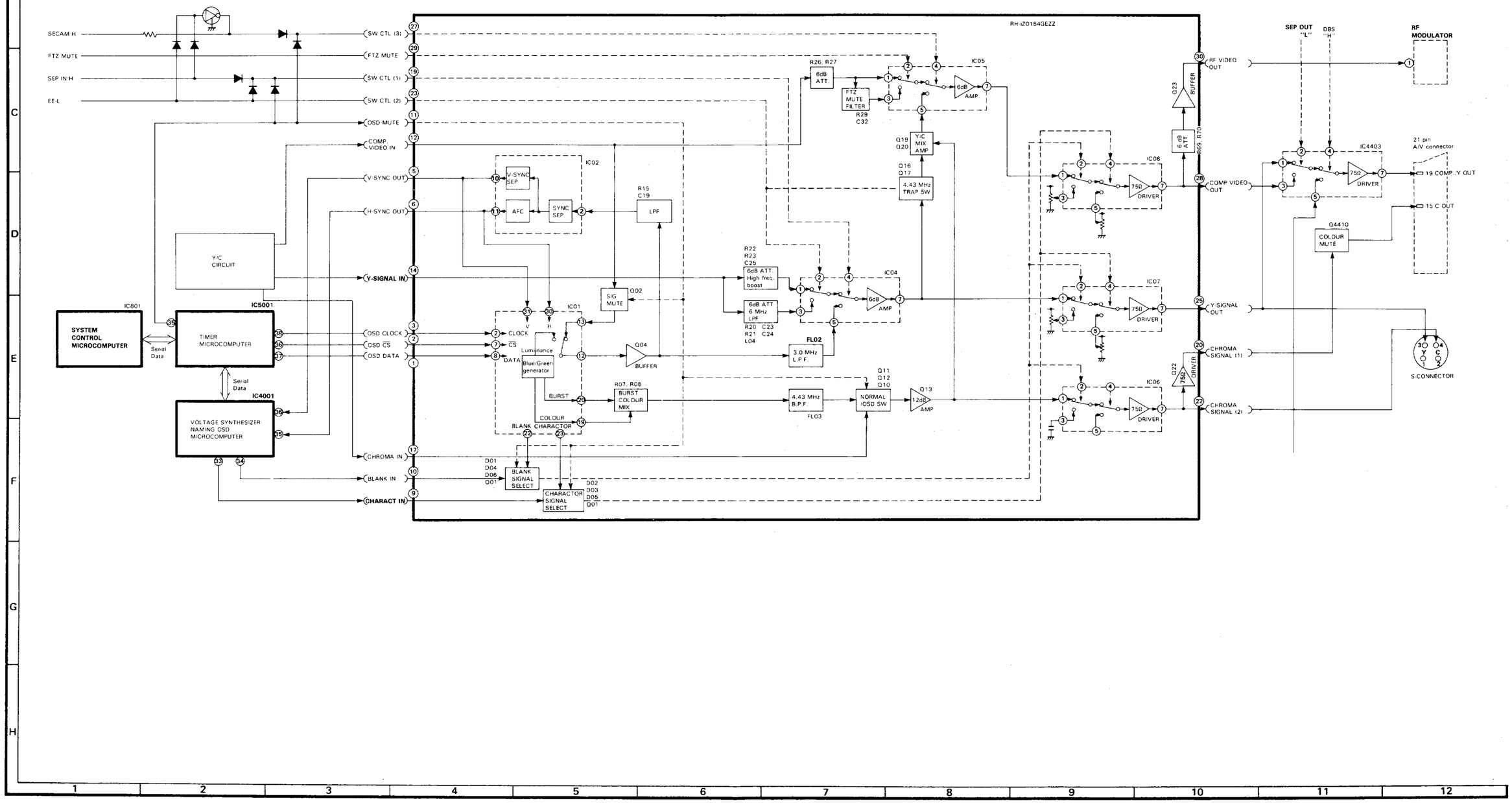
## LEVEL METER DEVICE BLOCK DIAGRAM



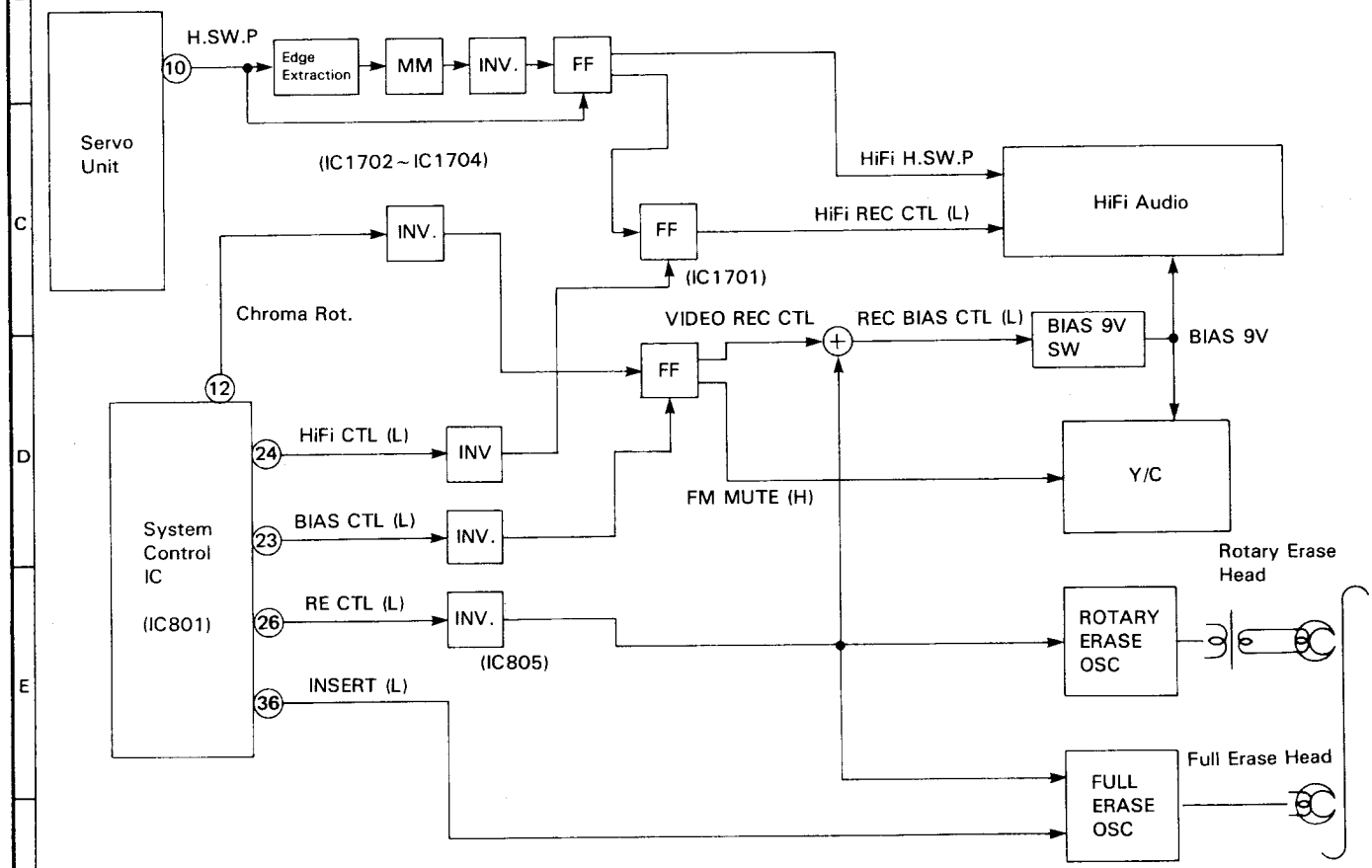
# ON SCREEN DISPLAY BLOCK DIAGRAM



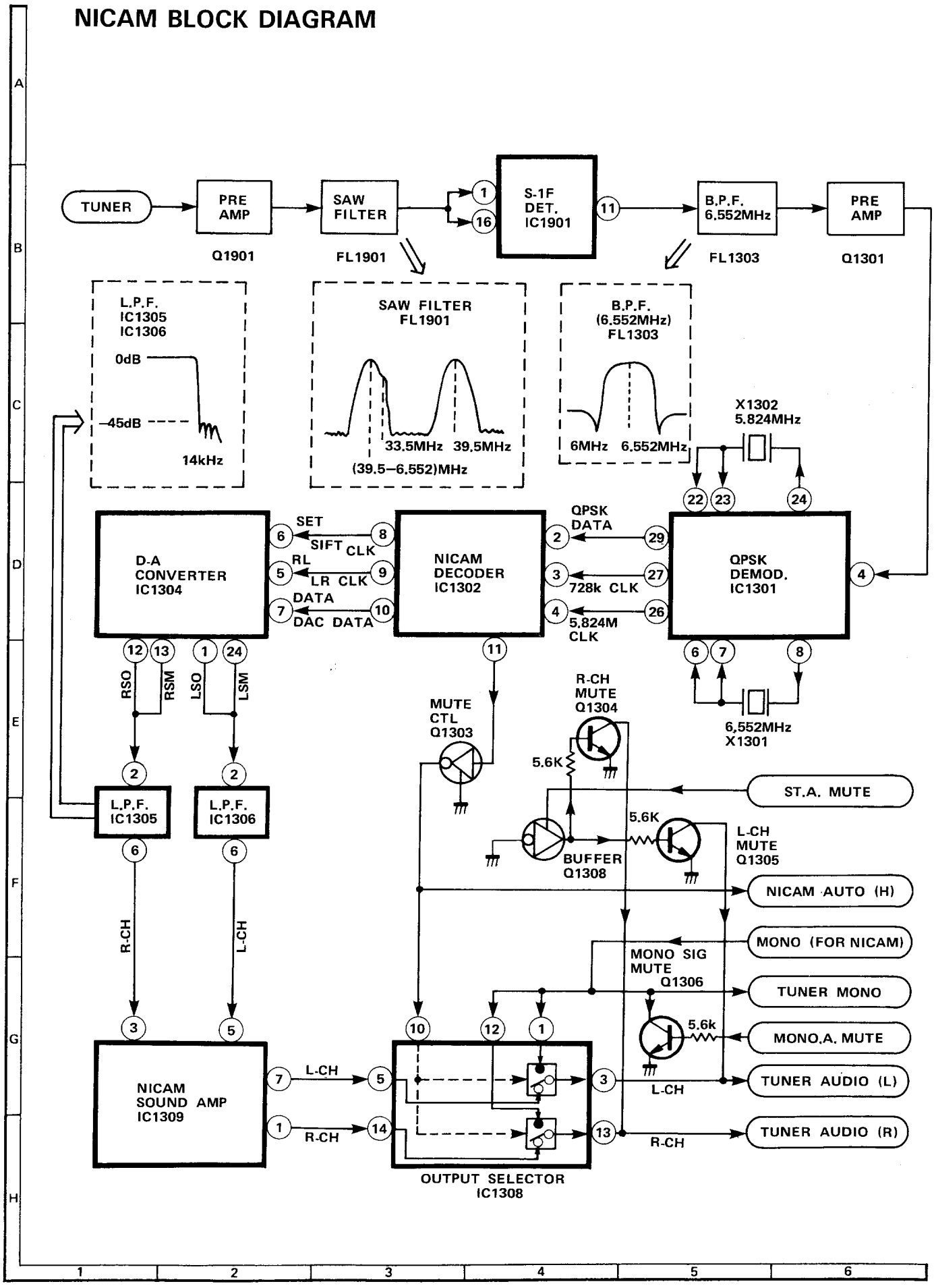
# ON SCREEN DISPLAY BLOCK DIAGRAM



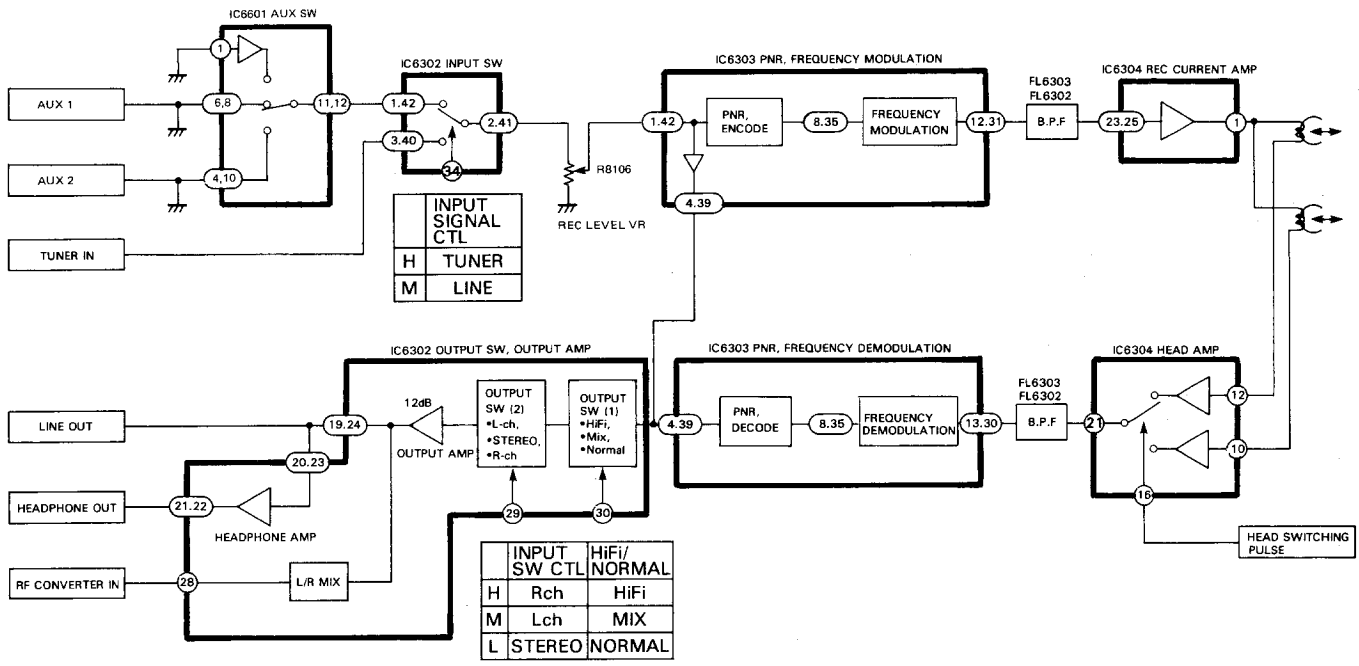
# FLYING ERASE BLOCK DIAGRAM



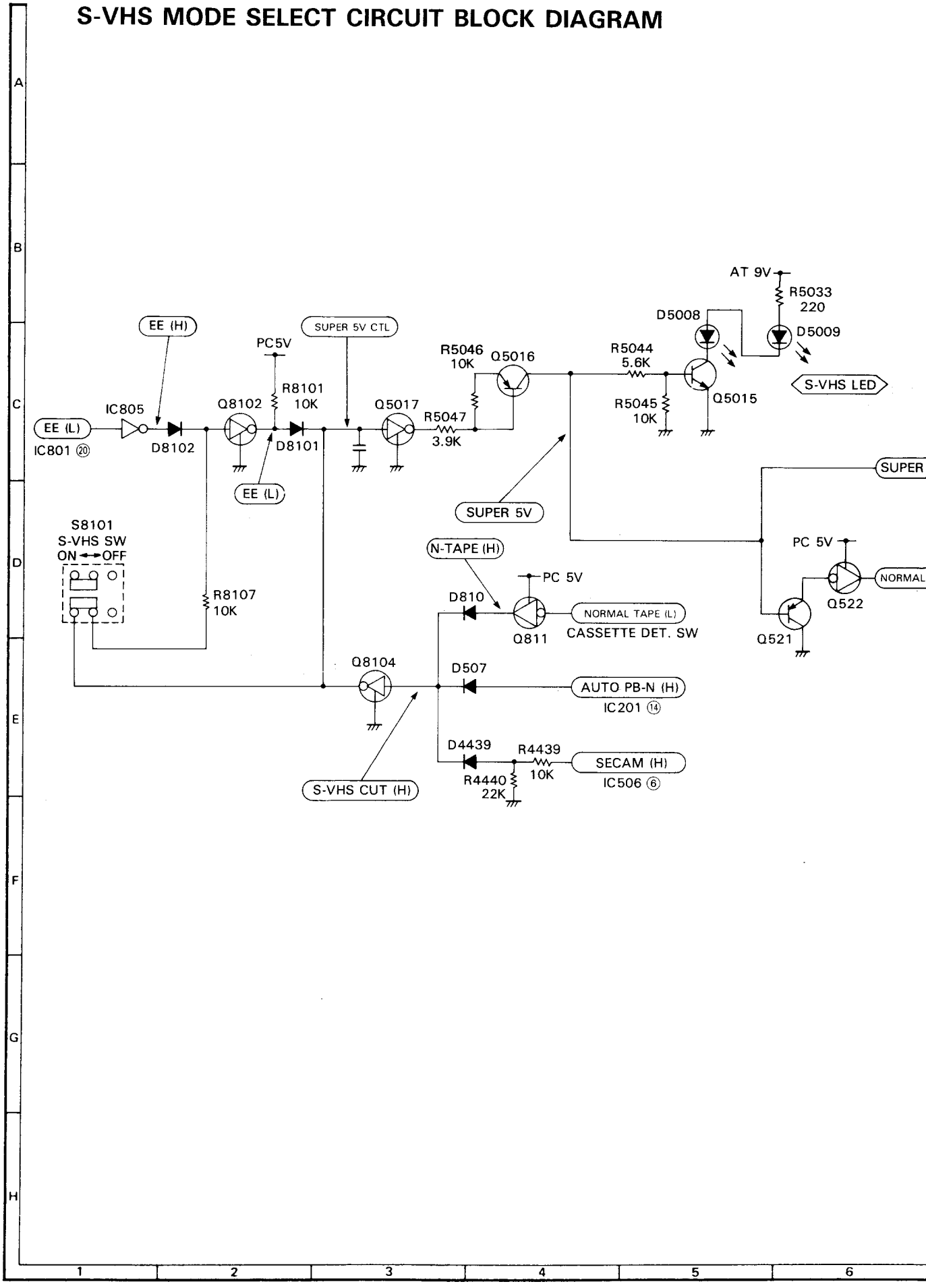
# NICAM BLOCK DIAGRAM



# Hi-Fi CIRCUIT BLOCK DIAGRAM

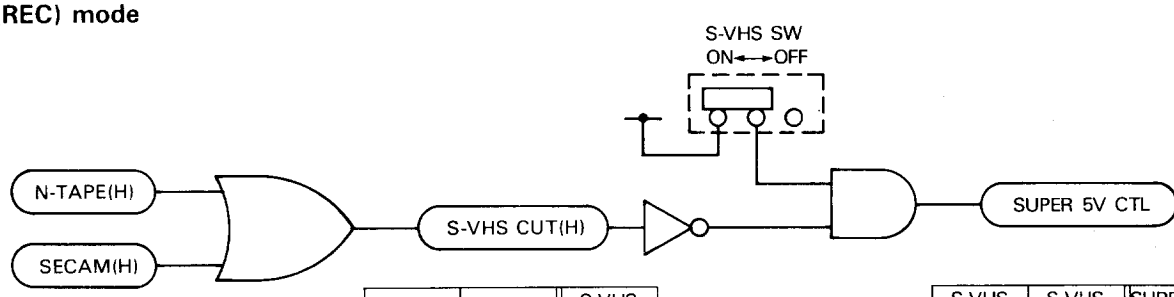


# S-VHS MODE SELECT CIRCUIT BLOCK DIAGRAM



# S-VHS MODE SELECT CIRCUIT BLOCK DIAGRAM

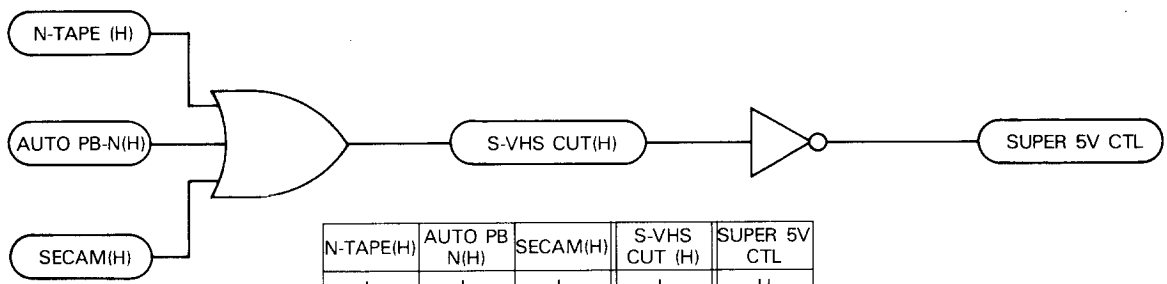
## IN EE (REC) mode




| N-TAPE(H) | SECAM(H) | S-VHS CUT (H) |
|---|---|---|
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | H |

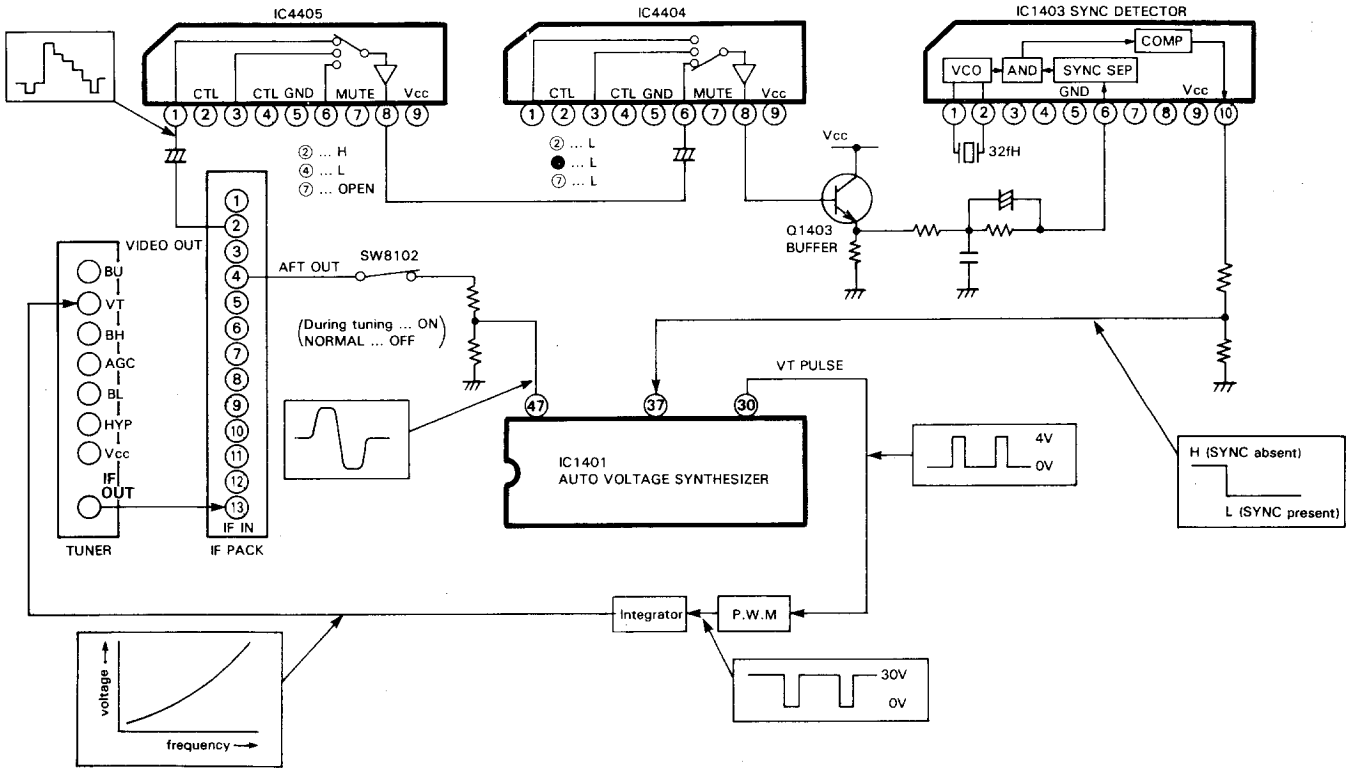
| S-VHS CUT (H) | S-VHS SW | SUPER 5V CTL |
|---|---|---|
| L | L | L |
| L | H | H |
| H | L | L |
| H | H | L |

## IN Playback mode




| N-TAPE(H) | AUTO PB N(H) | SECAM(H) | S-VHS CUT (H) | SUPER 5V CTL |
|---|---|---|---|---|
| L | L | L | L | H |
| L | L | H | H | L |
| L | H | L | H | L |
| L | H | H | H | L |
| H | L | L | H | L |
| H | L | H | H | L |
| H | H | L | H | L |
| H | H | H | H | L |

# AUTO VOLTAGE SYNTHESIZER BLOCK DIAGRAM



# SCHEMATIC DIAGRAM

*IMPORTANT SAFETY NOTICE:*
*BE SURE TO USE GENUINE PARTS FOR SECURING THE SAFETY AND RELIABILITY OF THE SET.*
*PARTS MARKED WITH "⚠" AND PARTS SHADED (IN BLACK) ARE ESPECIALLY IMPORTANT FOR MAINTAINING THE SAFETY AND PROTECTING ABILITY OF THE SET.*
*BE SURE TO REPLACE THEM WITH PARTS OF SPECIFIED PART NUMBER.*

*SAFETY NOTES:*

1. *DISCONNECT THE AC PLUG FROM THE AC OUTLET BEFORE REPLACING PARTS.*
2. *SEMICONDUCTOR HEAT SINKS SHOULD BE REGARDED AS POTENTIAL SHOCK HAZARDS WHEN THE CHASSIS IS OPERATING.*

*NOTES:*

1. *The unit of resistance "ohm" is omitted (k = 1000 ohm, M = 1 Meg ohm).*
2. *All resistors are 1/8 watt, unless otherwise noted.*
3. *The unit of capacitance "F" is omitted (μ = μF, p = μμF).*
4. ***The values in parentheses are the ones in the PB mode; the values without parentheses are the ones in the REC mode.***

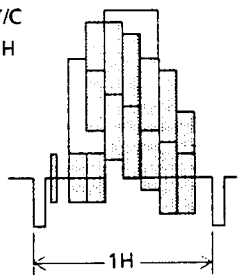
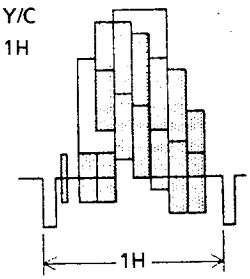
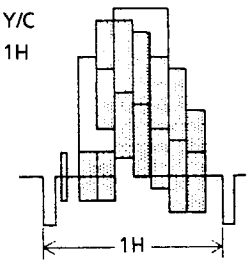
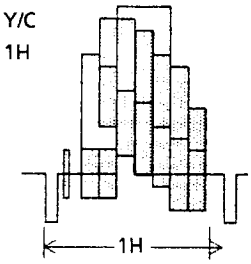
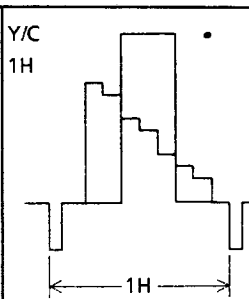
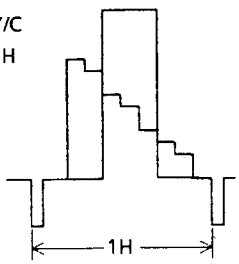
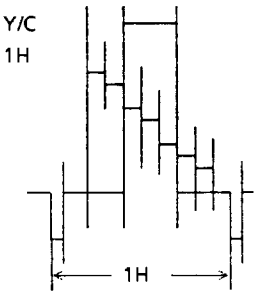
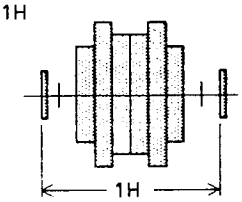
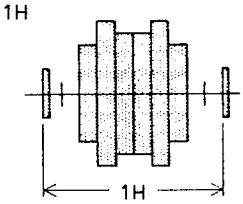
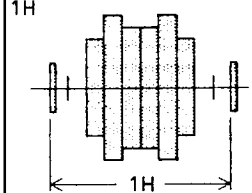
*VOLTAGE MEASUREMENT CONDITIONS:*

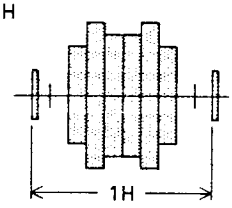
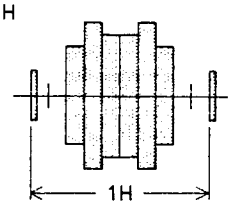
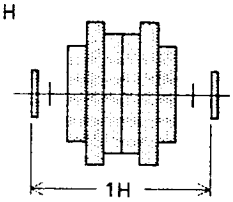
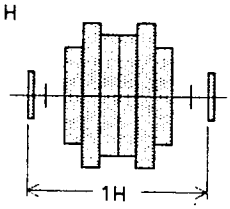
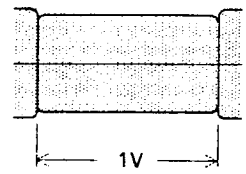
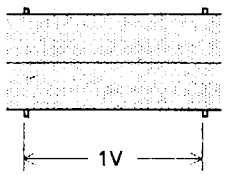
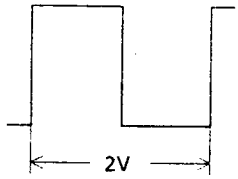
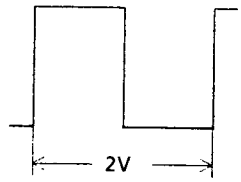
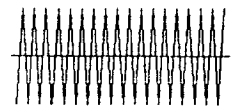
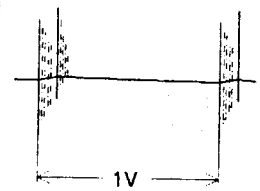
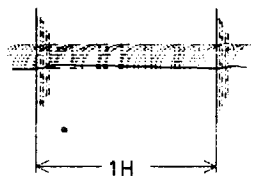
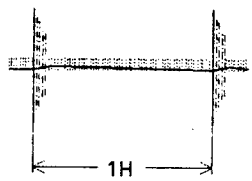
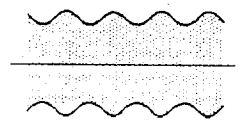
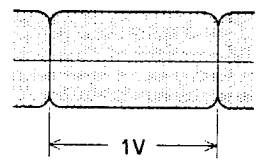
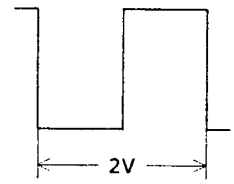
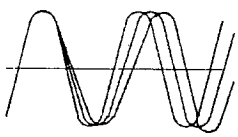
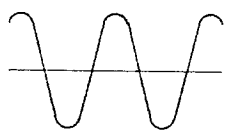
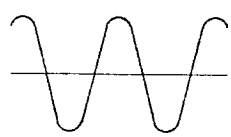
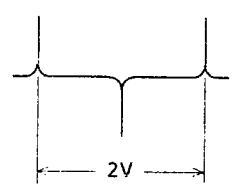
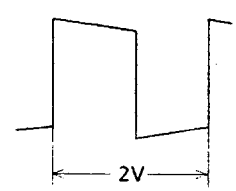
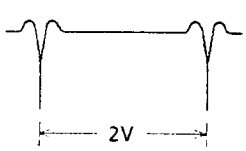
1. *DC voltages are measured between points indicated and **chassis ground by VTVM, with AC240V/50Hz supplied** to unit and all controls are set to normal viewing picture unless otherwise noted.*
2. *Voltages are measured with 10000μV B & W or colour signal.*

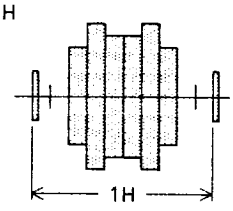
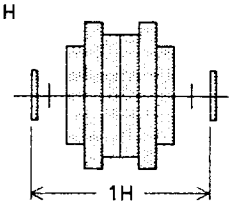
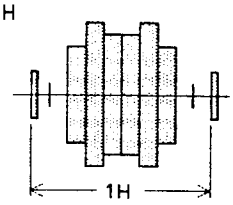
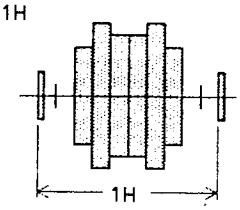
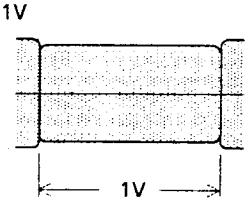
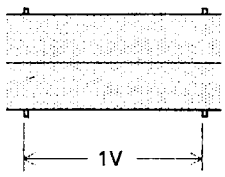
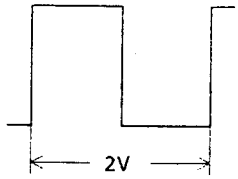
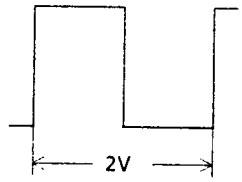
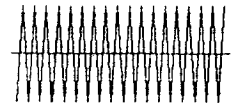
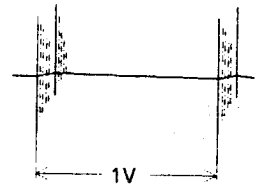
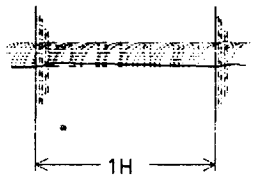
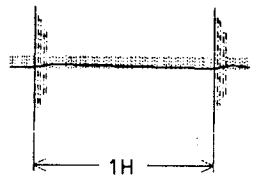
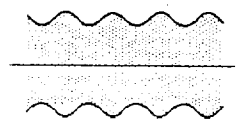
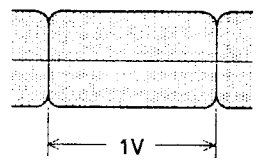
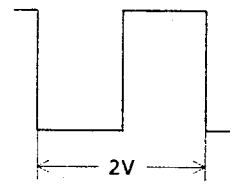
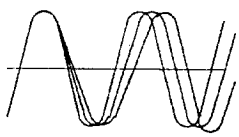
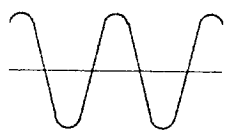
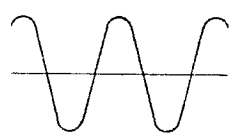
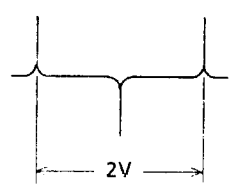
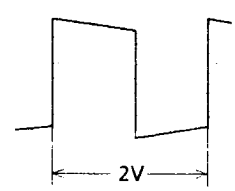
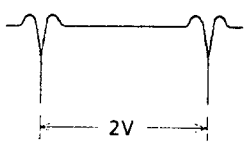
*WAVEFORM MEASUREMENT CONDITIONS:*
*10000μV 87.5 percent modulated colour ber signal is fed into tuner.*

*CAUTION:*
*This circuit diagram is original one. Therefore there may be a slight difference from yours.*

# WAVE FORMS

| | | | | |
|---|---|---|---|---|
| Y/C 1H  1H<br>V: 0.5 Vp-p<br>IC:201 PIN52 PB | Y/C 1H  1H<br>V: 0.9 Vp-p<br>YF CONNECTOR PIN1 | Y/C 1H  1H<br>V: 1.8 Vp-p<br>YF CONNECTOR PIN3<br>EE | Y/C 1H  1H<br>V: 1.8Vp-p<br>YF CONNECTOR PIN5<br>EE/PB | Y/C 1H  1H<br>V: 400mVp-p<br>TP401 PB/REC |
| Y/C 1H  1H<br>V: 1.9 Vp-p<br>YF CONNECTOR PIN3<br>PB | Y/C 1H  1H<br>V: 1.08 Vp-p<br>TP201 EE | Y/C 1H  1H<br>V: 47mVp-p<br>R522 C-LEVEL<br>ADJ-VR PIN2 EE | Y/C 1H  1H<br>V: 500mVp-p<br>IC504 PIN1 PB | Y/C 1H  1H<br>V: 100mVp-p<br>TP502 EE |

| | | | | |
|---|---|---|---|---|
| Y/C<br>1H<br>  <br><br>V: 130mVp-p<br>Q539 EMITTER PB | Y/C<br>1H<br>  <br><br>V: 270mVp-p<br>IC504 PIN17 EE | Y/C<br>1H<br>  <br><br>V: 200mVp-p<br>YG CONNECTOR PIN5<br>EE/PB | Y/C<br>1H<br>  <br><br>V: 200mVp-p<br>Q502 EMITTER PB | Y/C<br>1V<br>  <br><br>V: 6mVp-p REC<br>V: 200mVp-p PB<br>TP301 |
| Y/C<br>1V<br>  <br><br>V: 450mVp-p<br>IC301 PIN10 PB | Y/C<br>2V<br>  <br><br>V: 4.8Vp-p<br>TP302 PB<br>HEAD SW. PULSE | Y/C<br>2V<br>  <br><br>V: 4.0 VP-P<br>IC504 PIN13 PB | Y/C<br>  <br>H: 13.3MHz<br>V: 170mVp-p EE<br>V: 150mVp-p PB<br>Q408 COLLECTER | Y/C<br>1V<br>  <br><br>V: 5.6 Vp-p<br>TP504 EE |
| Y/C<br>1H<br>  <br><br>V: 15mVp-p<br>TP202 PB | Y/C<br>1H<br>  <br><br>V: 15mVp-p<br>TP202 EE | AUDIO (Hi-Fi)<br>  <br>H: 1KHz<br>V: 0.3Vp-p<br>TP6301~2 REC | AUDIO (Hi-Fi)<br>1V<br>  <br><br>V: 40mVp-p<br>TP6305, TP6306 PB | AUDIO (Hi-Fi)<br>2V<br>  <br><br>V: 4.8Vp-p<br>TP6304 PB |
| AUDIO (Hi-Fi)<br>  <br>H: 1KHz<br>V: 250mVp-p<br>TP6305, 6306 REC | AUDIO (LINEAR)<br>  <br>H: 1KHz<br>V: 29mVp-p<br>IC6302 PIN36 REC/EE | AUDIO (LINEAR)<br>  <br>H: 1KHz<br>V: 1mVp-p<br>BA CONNECTOR PIN1<br>PB | SERVO<br>2V<br>  <br><br>V: 1.2Vp-p<br>IC701 PIN42 PB | SERVO<br>2V<br>  <br><br>V: 4.6 Vp-p<br>IC701 PIN33 PB |
| SERVO<br>2V<br>  <br><br>V: 0.6Vp-p<br>IC701 PIN4 PB | | | | |

| | | | | |
|---|---|---|---|---|
| Y/C<br>1H<br>  <br><br>V: 130mVp-p<br>Q539 EMITTER PB | Y/C<br>1H<br>  <br><br>V: 270mVp-p<br>IC504 PIN17 EE | Y/C<br>1H<br>  <br><br>V: 200mVp-p<br>YG CONNECTOR PIN5<br>EE/PB | Y/C<br>1H<br>  <br><br>V: 200mVp-p<br>Q502 EMITTER PB | Y/C<br>1V<br>  <br><br>V: 6mVp-p REC<br>V: 200mVp-p PB<br>TP301 |
| Y/C<br>1V<br>  <br><br>V: 450mVp-p<br>IC301 PIN10 PB | Y/C<br>2V<br>  <br><br>V: 4.8Vp-p<br>TP302 PB<br>HEAD SW. PULSE | Y/C<br>2V<br>  <br><br>V: 4.0 VP-P<br>IC504 PIN13 PB | Y/C<br>  <br>H: 13.3MHz<br>V: 170mVp-p EE<br>V: 150mVp-p PB<br>Q408 COLLECTER | Y/C<br>1V<br>  <br><br>V: 5.6 Vp-p<br>TP504 EE |
| Y/C<br>1H<br>  <br><br>V: 15mVp-p<br>TP202 PB | Y/C<br>1H<br>  <br><br>V: 15mVp-p<br>TP202 EE | AUDIO (Hi-Fi)<br>  <br>H: 1KHz<br>V: 0.3Vp-p<br>TP6301~2 REC | AUDIO (Hi-Fi)<br>1V<br>  <br><br>V: 40mVp-p<br>TP6305, TP6306 PB | AUDIO (Hi-Fi)<br>2V<br>  <br><br>V: 4.8Vp-p<br>TP6304 PB |
| AUDIO (Hi-Fi)<br>  <br>H: 1KHz<br>V: 250mVp-p<br>TP6305, 6306 REC | AUDIO (LINEAR)<br>  <br>H: 1KHz<br>V: 29mVp-p<br>IC6302 PIN36 REC/EE | AUDIO (LINEAR)<br>  <br>H: 1KHz<br>V: 1mVp-p<br>BA CONNECTOR PIN1<br>PB | SERVO<br>2V<br>  <br><br>V: 1.2Vp-p<br>IC701 PIN42 PB | SERVO<br>2V<br>  <br><br>V: 4.6 Vp-p<br>IC701 PIN33 PB |
| SERVO<br>2V<br>  <br><br>V: 0.6Vp-p<br>IC701 PIN4 PB | | | | |

# SCHEMATIC DIAGRAM

*IMPORTANT SAFETY NOTICE:*
*BE SURE TO USE GENUINE PARTS FOR SECURING THE SAFETY AND RELIABILITY OF THE SET.*
*PARTS MARKED WITH "⚠" AND PARTS SHADED (IN BLACK) ARE ESPECIALLY IMPORTANT FOR MAINTAINING THE SAFETY AND PROTECTING ABILITY OF THE SET.*
*BE SURE TO REPLACE THEM WITH PARTS OF SPECIFIED PART NUMBER.*

*SAFETY NOTES:*

1. *DISCONNECT THE AC PLUG FROM THE AC OUTLET BEFORE REPLACING PARTS.*
2. *SEMICONDUCTOR HEAT SINKS SHOULD BE REGARDED AS POTENTIAL SHOCK HAZARDS WHEN THE CHASSIS IS OPERATING.*

*NOTES:*

1. *The unit of resistance "ohm" is omitted (k = 1000 ohm, M = 1 Meg ohm).*
2. *All resistors are 1/8 watt, unless otherwise noted.*
3. *The unit of capacitance "F" is omitted (μ = μF, p = μμF).*
4. ***The values in parentheses are the ones in the PB mode; the values without parentheses are the ones in the REC mode.***

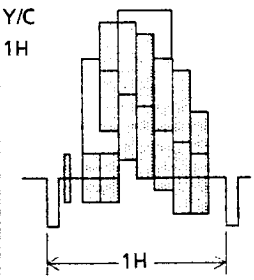
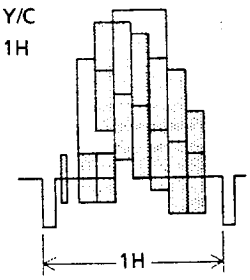
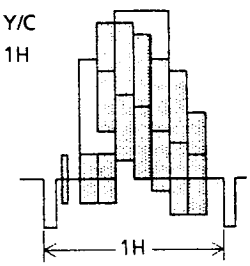
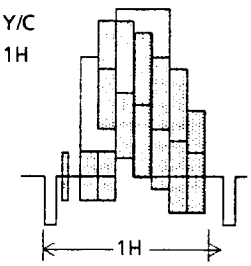
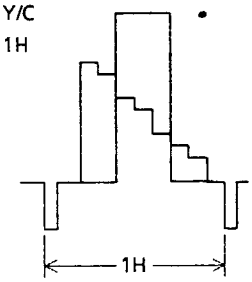
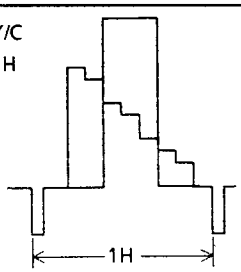
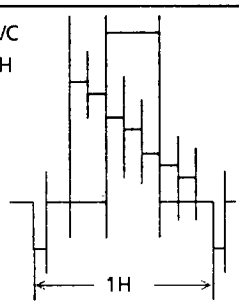
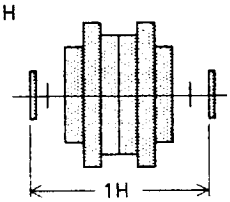
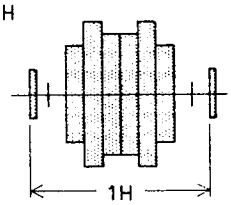
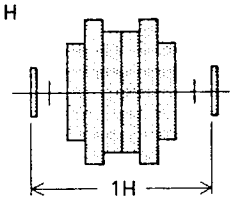
*VOLTAGE MEASUREMENT CONDITIONS:*

1. *DC voltages are measured between points indicated and **chassis ground by VTVM, with AC240V/50Hz supplied** to unit and all controls are set to normal viewing picture unless otherwise noted.*
2. *Voltages are measured with 10000μV B & W or colour signal.*

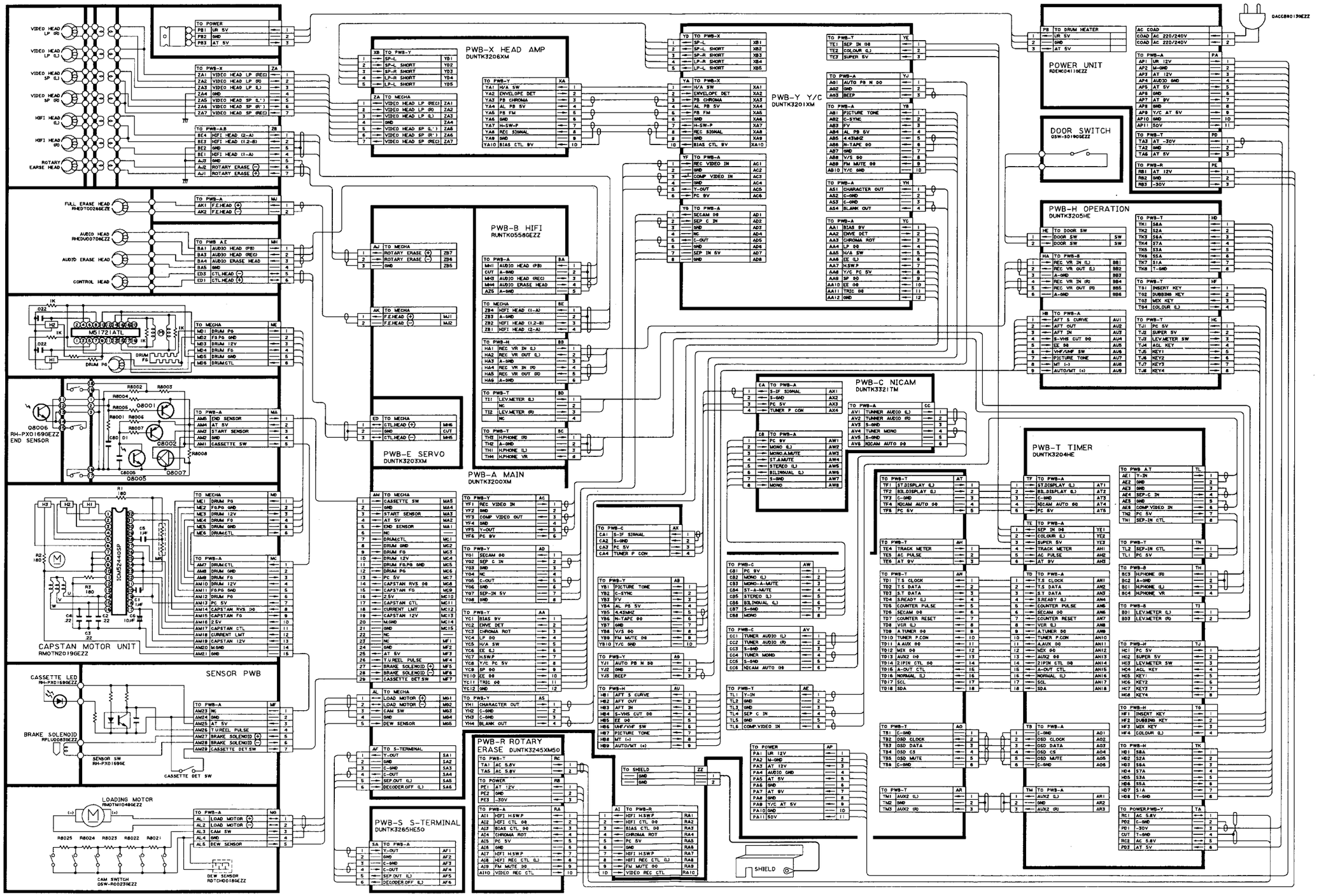
*WAVEFORM MEASUREMENT CONDITIONS:*
*10000μV 87.5 percent modulated colour ber signal is fed into tuner.*

*CAUTION:*
*This circuit diagram is original one. Therefore there may be a slight difference from yours.*

# WAVE FORMS

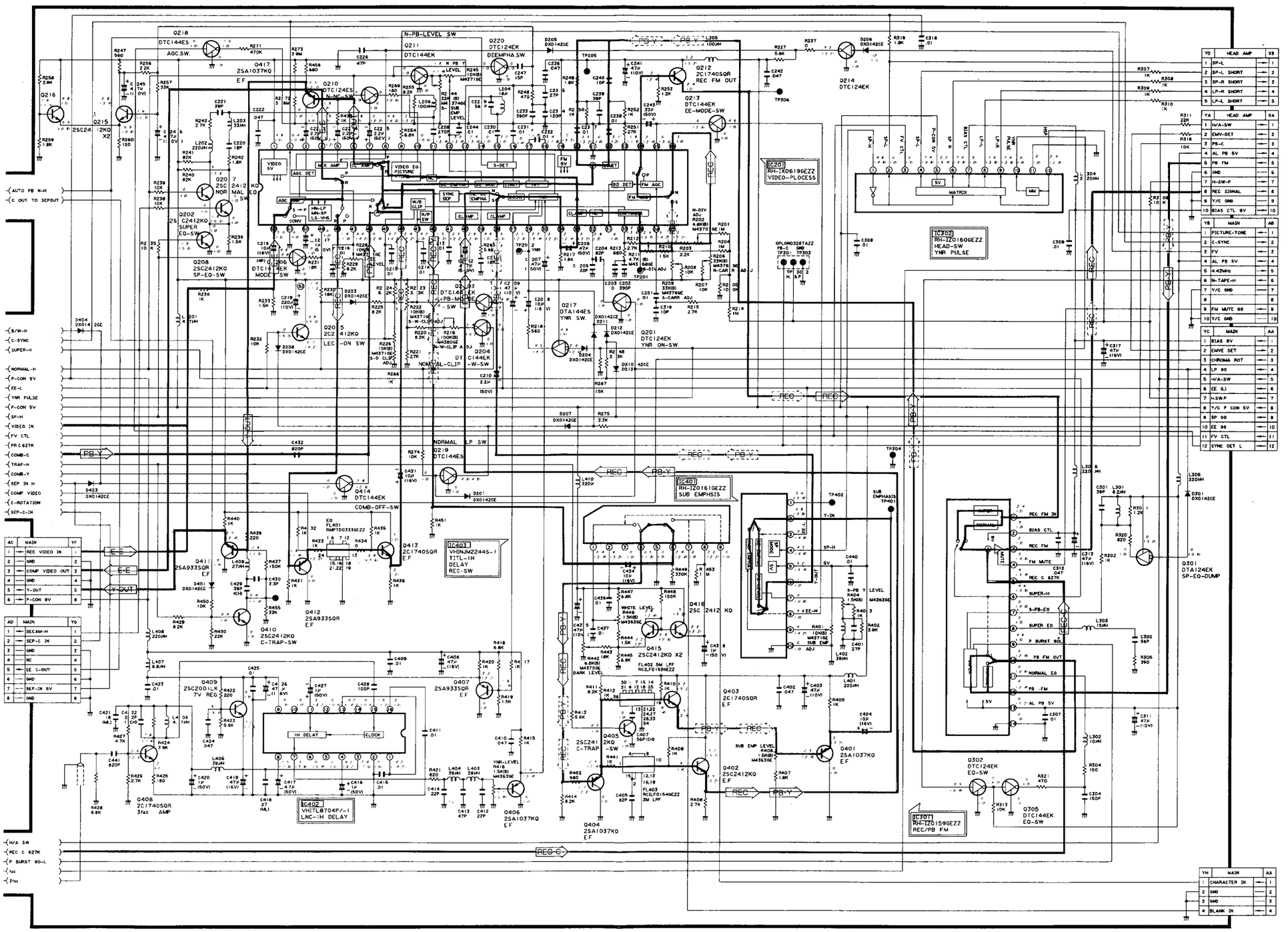
| | | | | |
|---|---|---|---|---|
| Y/C 1H  1H<br>V: 0.5 Vp-p<br>IC:201 PIN52 PB | Y/C 1H  1H<br>V: 0.9 Vp-p<br>YF CONNECTOR PIN1 | Y/C 1H  1H<br>V: 1.8 Vp-p<br>YF CONNECTOR PIN3<br>EE | Y/C 1H  1H<br>V: 1.8Vp-p<br>YF CONNECTOR PIN5<br>EE/PB | Y/C 1H  1H<br>V: 400mVp-p<br>TP401 PB/REC |
| Y/C 1H  1H<br>V: 1.9 Vp-p<br>YF CONNECTOR PIN3<br>PB | Y/C 1H  1H<br>V: 1.08 Vp-p<br>TP201 EE | Y/C 1H  1H<br>V: 47mVp-p<br>R522 C-LEVEL<br>ADJ-VR PIN2 EE | Y/C 1H  1H<br>V: 500mVp-p<br>IC504 PIN1 PB | Y/C 1H  1H<br>V: 100mVp-p<br>TP502 EE |

# OVERALL DIAGRAM



# Y/C CIRCUIT 1

Y-OUT Luminance Signal (Out)
E-E Video E-E Signal
REC Recording Signal (VHS)
REC Recording Signal (S-VHS)
REC-C Recording Chrominance Signal
PB-Y Playback Luminance Signal (VHS)
PB-Y Playback Luminance Signal (S-VHS)



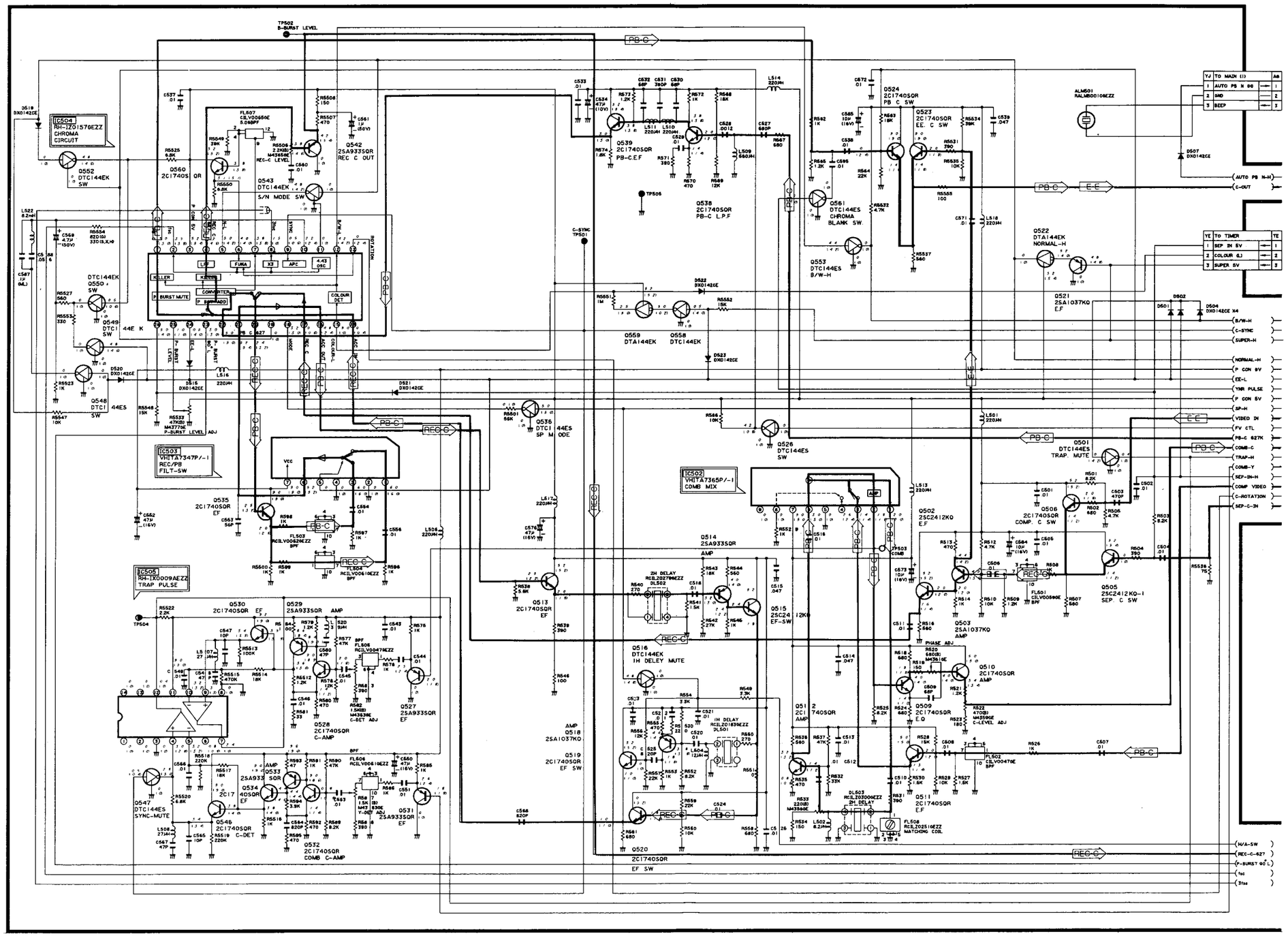

* VOLTAGE MEASUREMENT MODE
PB ..... Parentheses ( )
REC ..... Without Parentheses

# Y/C CIRCUIT 2

E-E E-E Signal

REC-C Recording Chrominance Signal

PB-C Playback Chrominance Signal

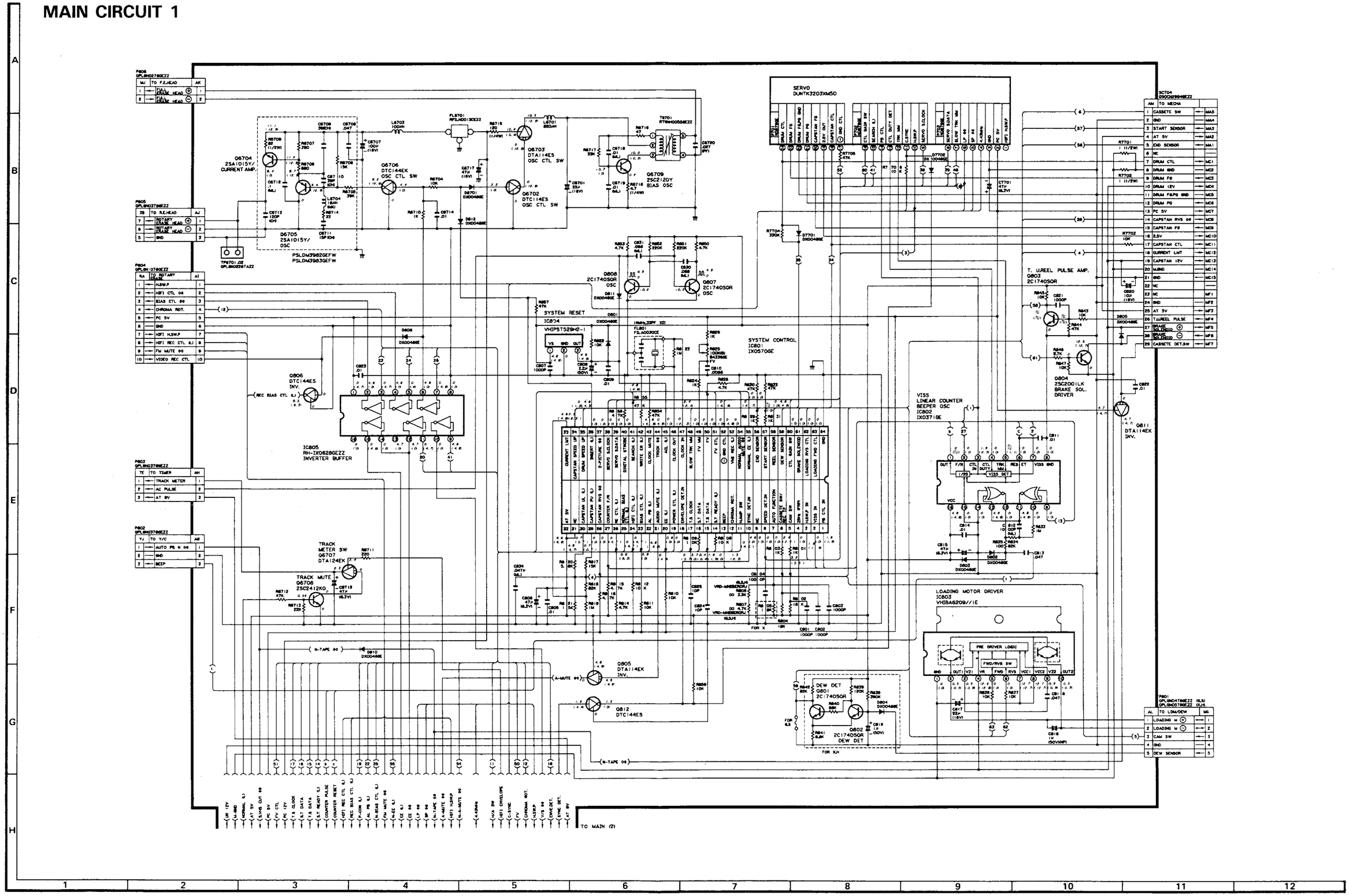



* VOLTAGE MEASUREMENT MODE

PB ..... Parentheses ( )

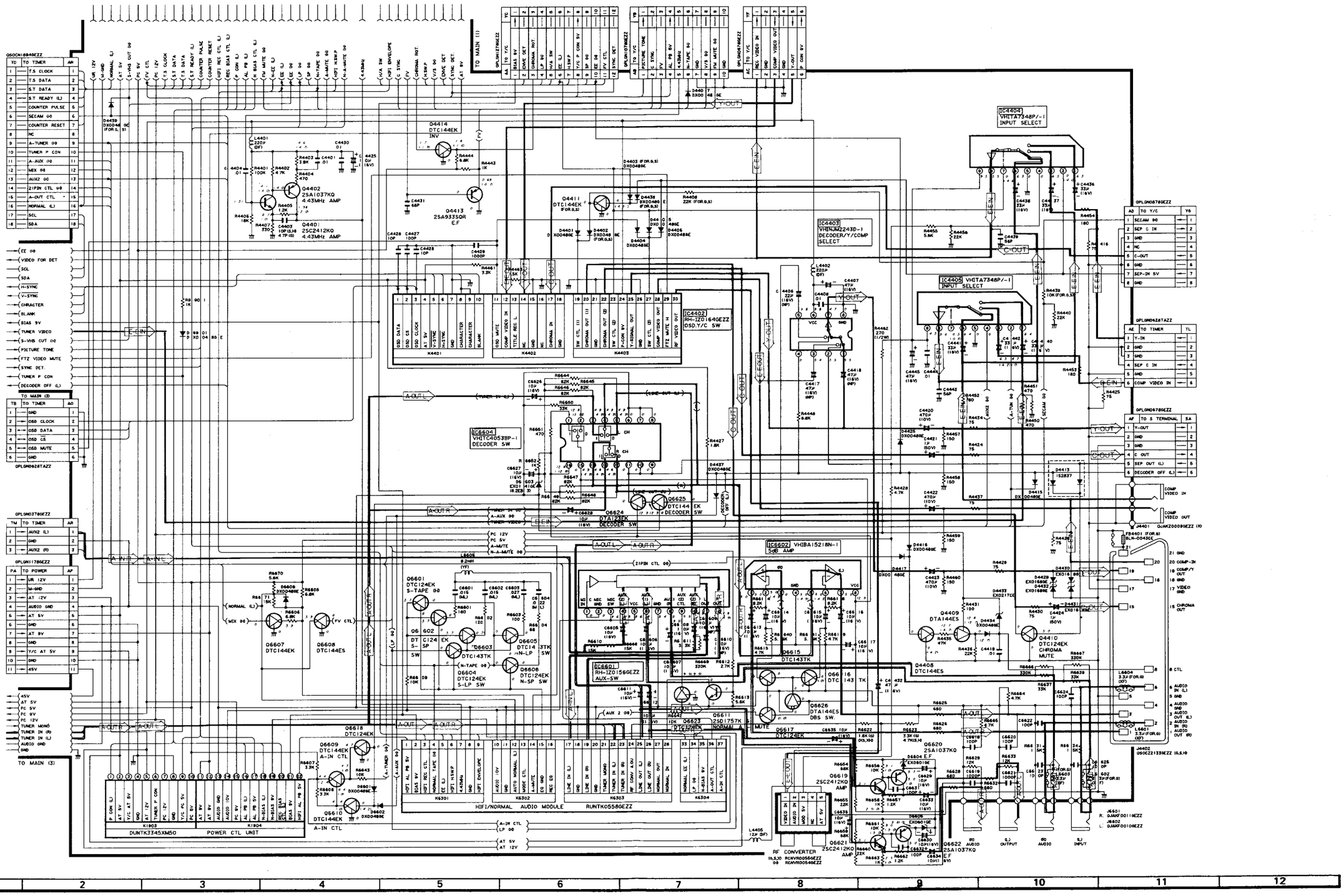
REC ..... Without Parentheses

# MAIN CIRCUIT 1



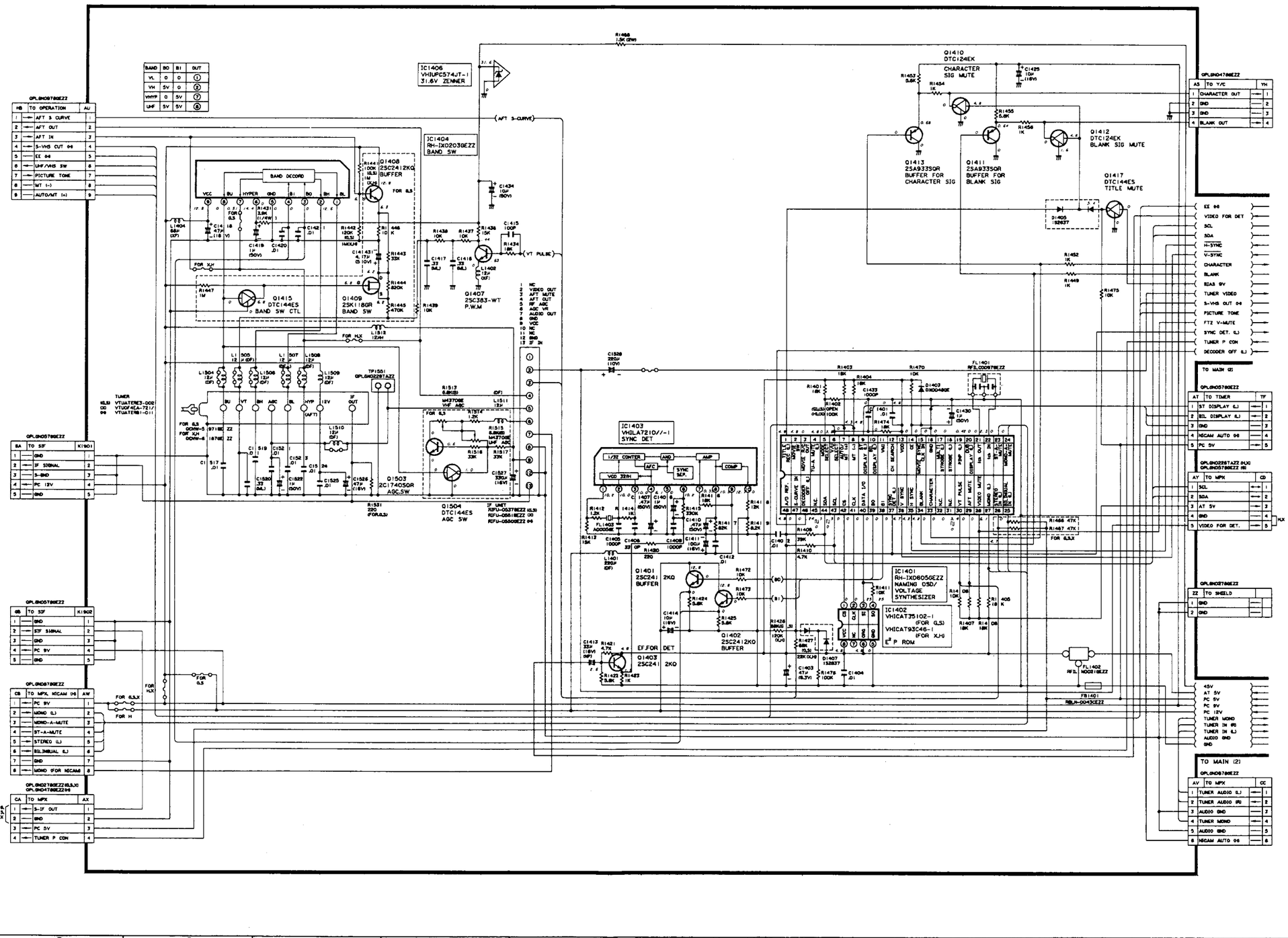
# MAIN CIRCUIT 2

E-E IN Video E-E Signal (In)
E-E OUT Video E-E Signal (Out)
A-IN R Audio-In (R)
A-IN L Audio-In (L)
A-OUT R Audio-Out (R)
A-OUT L Audio-Out (L)
C-OUT Chrominance Signal (Out)
Y-OUT Luminance Signal (Out)




* VOLTAGE MEASUREMENT MODE
PB .....Parentheses ( )
REC .....Without Parentheses

# MAIN CIRCUIT 3




| BAND | B0 | B1 | OUT |
|---|---|---|---|
| VL | 0 | 0 | ① |
| VH | 5V | 0 | ② |
| VHYP | 0 | 5V | ⑦ |
| UHF | 5V | 5V | ⑧ |

| HB | TO OPERATION | AU |
|---|---|---|
| 1 | AFT S CURVE | 1 |
| 2 | AFT OUT | 2 |
| 3 | AFT IN | 3 |
| 4 | S-VHS CUT 04 | 4 |
| 5 | EE 04 | 5 |
| 6 | UHF/VHS SW | 6 |
| 7 | PICTURE TONE | 7 |
| 8 | MT (-) | 8 |
| 9 | AUTO/MT (+) | 9 |

| AS | TO Y/C | YH |
|---|---|---|
| 1 | CHARACTER OUT | 1 |
| 2 | GND | 2 |
| 3 | GND | 3 |
| 4 | BLANK OUT | 4 |

| AT | TO TIMER | TF |
|---|---|---|
| 1 | ST DISPLAY (L) | 1 |
| 2 | BIL DISPLAY (L) | 2 |
| 3 | GND | 3 |
| 4 | NICAM AUTO 06 | 4 |
| 5 | PC 5V | 5 |

| AY | TO MPX | CD |
|---|---|---|
| 1 | SCL | 1 |
| 2 | SDA | 2 |
| 3 | AT 5V | 3 |
| 4 | GND | 4 |
| 5 | VIDEO FOR DET. | 5 |

| ZZ | TO SHIELD |
|---|---|
| 1 | GND |
| 2 | GND |

| AV | TO MPX | CC |
|---|---|---|
| 1 | TUNER AUDIO (L) | 1 |
| 2 | TUNER AUDIO (R) | 2 |
| 3 | AUDIO GND | 3 |
| 4 | TUNER MONO | 4 |
| 5 | AUDIO GND | 5 |
| 6 | NICAM AUTO 06 | 6 |

| BA | TO SIF | K1901 |
|---|---|---|
| 1 | GND | 1 |
| 2 | IF SIGNAL | 2 |
| 3 | S-GND | 3 |
| 4 | PC 12V | 4 |
| 5 | GND | 5 |

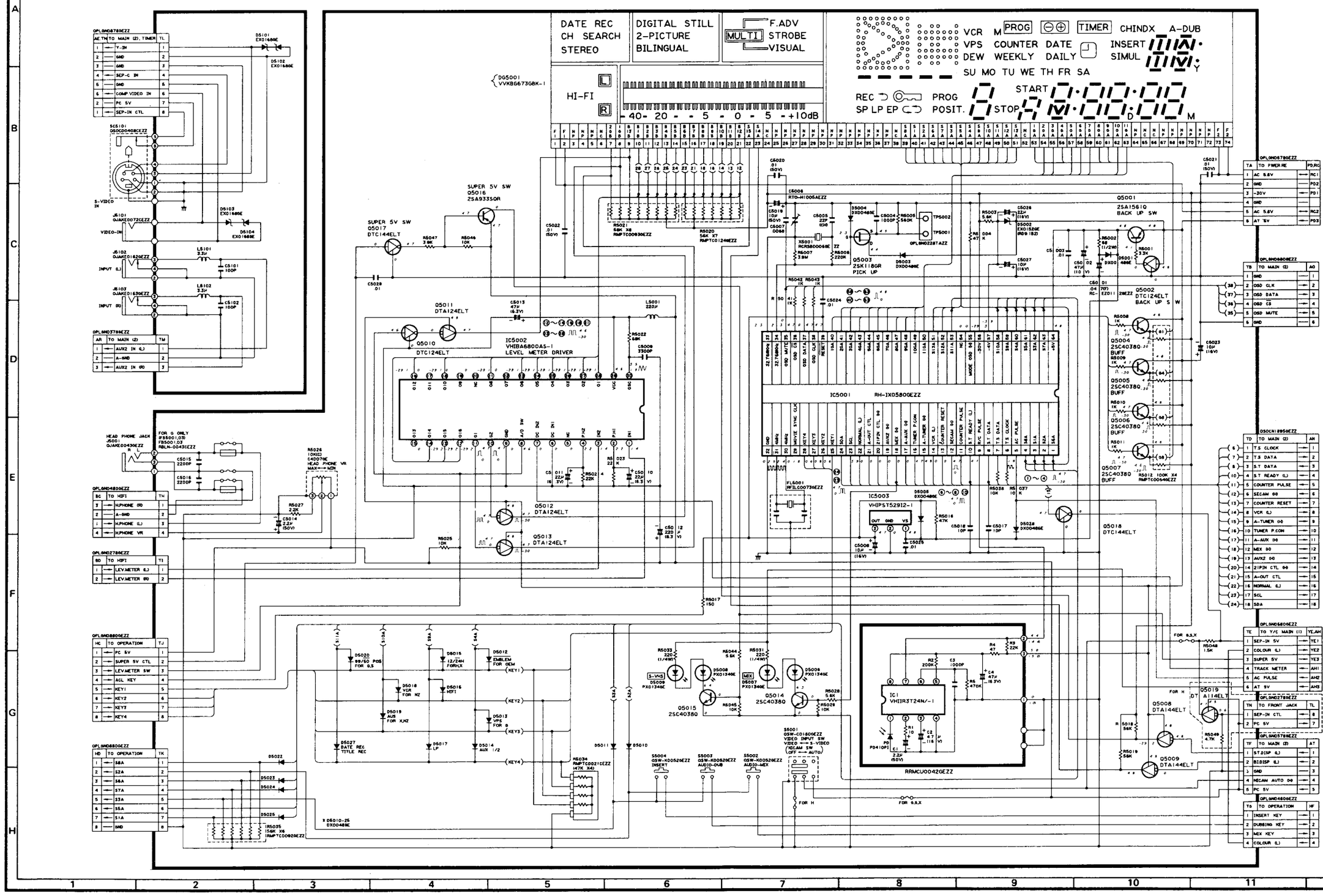
| GB | TO SIF | K1902 |
|---|---|---|
| 1 | GND | 1 |
| 2 | STF SIGNAL | 2 |
| 3 | GND | 3 |
| 4 | PC 9V | 4 |
| 5 | GND | 5 |

| CB | TO MPX, NICAM (H) | AW |
|---|---|---|
| 1 | PC 9V | 1 |
| 2 | MONO (L) | 2 |
| 3 | MONO-A-MUTE | 3 |
| 4 | ST-A-MUTE | 4 |
| 5 | STEREO (L) | 5 |
| 6 | BIL.SIG.(L) | 6 |
| 7 | GND | 7 |
| 8 | MONO (FOR NICAM) | 8 |

| CA | TO MPX | AX |
|---|---|---|
| 1 | S-IF OUT | 1 |
| 2 | GND | 2 |
| 3 | PC 5V | 3 |
| 4 | TUNER P CON | 4 |

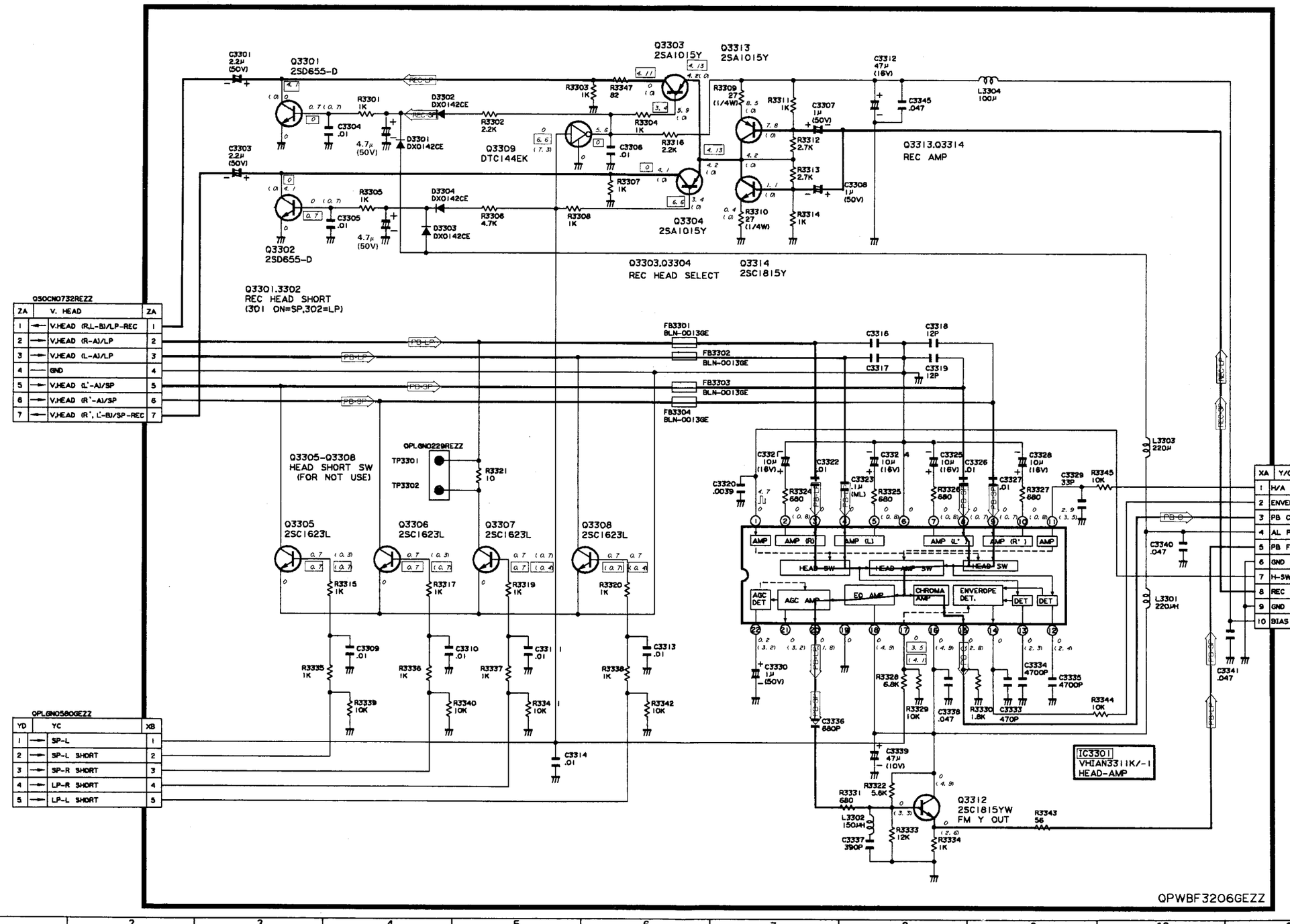
| AT | TO Y/C | YH |
|---|---|---|
| 1 | 4.5V | 1 |
| 2 | AT 5V | 2 |
| 3 | PC 5V | 3 |
| 4 | PC 9V | 4 |
| 5 | PC 12V | 5 |
| 6 | TUNER MONO | 6 |
| 7 | TUNER IN #S | 7 |
| 8 | TUNER IN #J | 8 |
| 9 | AUDIO GND | 9 |
| 10 | GND | 10 |

# TIMER AND FRONT JACK CIRCUIT



# HEAD AMPLIFIER CIRCUIT

REC-SP Recording FM(SP) Signal
REC-LP Recording FM(LP) Signal
PB-C Playback Chrominance Signal
PB-SP Playback FM(SP) Signal
PB-LP Playback FM(LP) Signal




050CN0732REZZ

| ZA | | V. HEAD | ZA |
|---|---|---|---|
| 1 | → | V.HEAD (R,L-B)/LP-REC | 1 |
| 2 | → | V.HEAD (R-A)/LP | 2 |
| 3 | → | V.HEAD (L-A)/LP | 3 |
| 4 | — | GND | 4 |
| 5 | → | V.HEAD (L')-A)/SP | 5 |
| 6 | → | V.HEAD (R')-A)/SP | 6 |
| 7 | → | V.HEAD (R', L'-B)/SP-REC | 7 |

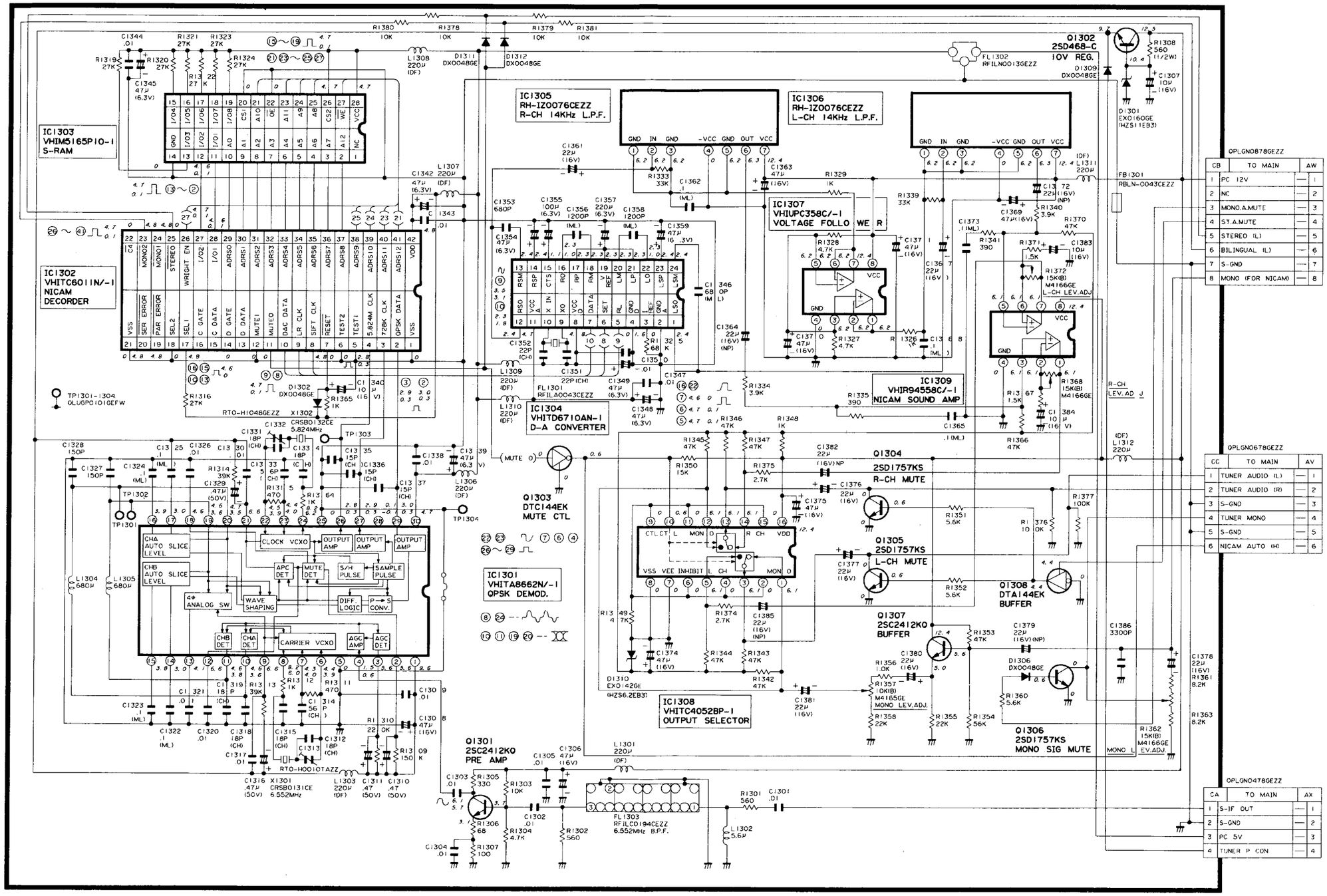
QPLGN0580GEZZ

| YD | | YC | XB |
|---|---|---|---|
| 1 | → | SP-L | 1 |
| 2 | → | SP-L SHORT | 2 |
| 3 | → | SP-R SHORT | 3 |
| 4 | → | LP-R SHORT | 4 |
| 5 | → | LP-L SHORT | 5 |

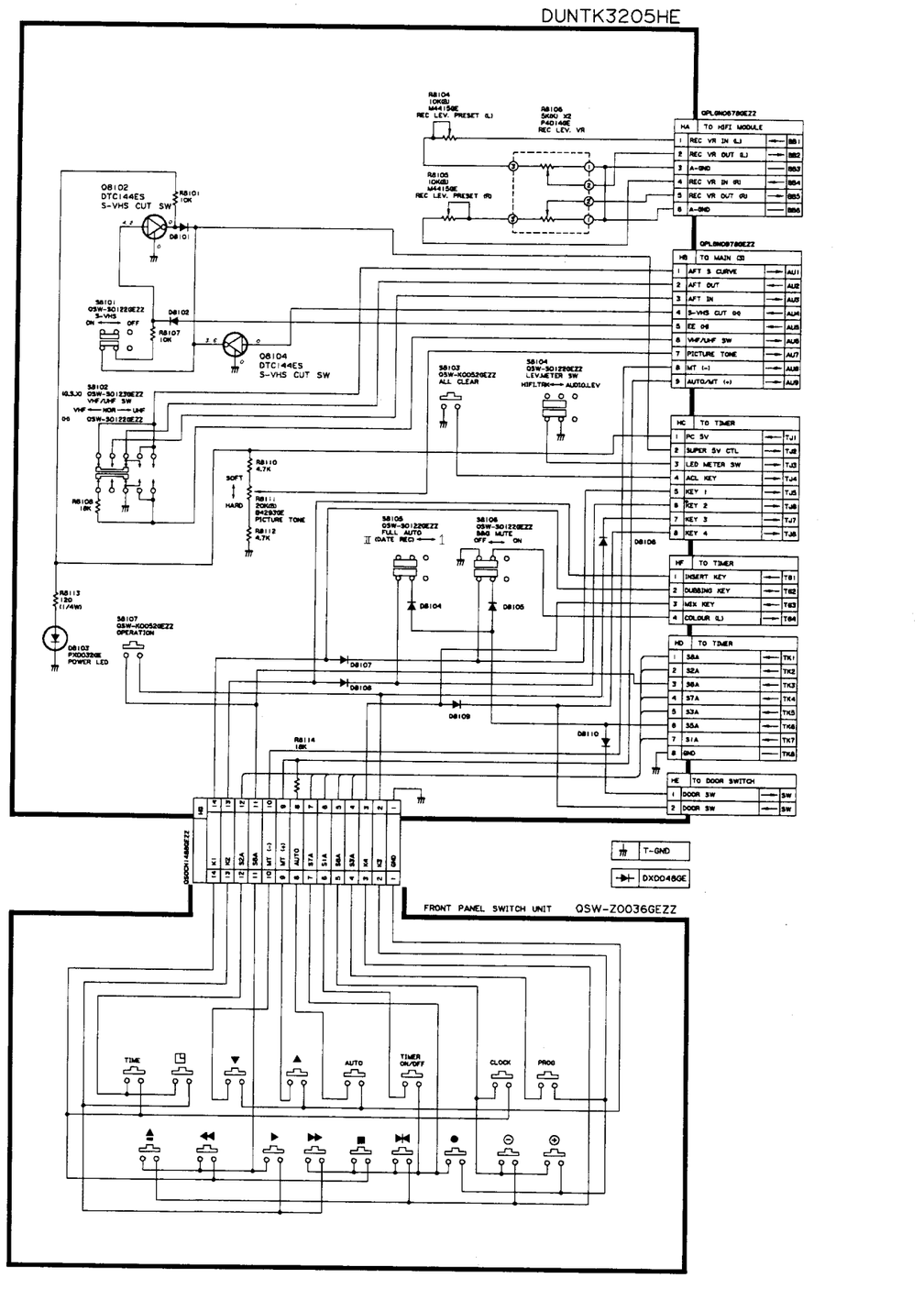
| XA | Y/C (1) | YA |
|---|---|---|
| 1 | H/A SW | 1 |
| 2 | ENVELOPE DET. | 2 |
| 3 | PB CHROMA | 3 |
| 4 | AL PB 5V | 4 |
| 5 | PB FM | 5 |
| 6 | GND | 6 |
| 7 | H-SW-P | 7 |
| 8 | REC SIGNAL | 8 |
| 9 | GND | 9 |
| 10 | BIAS CTL 9V | 10 |

* VOLTAGE MEASUREMENT MODE
PB .....Parentheses ( )
REC .....Without Parentheses

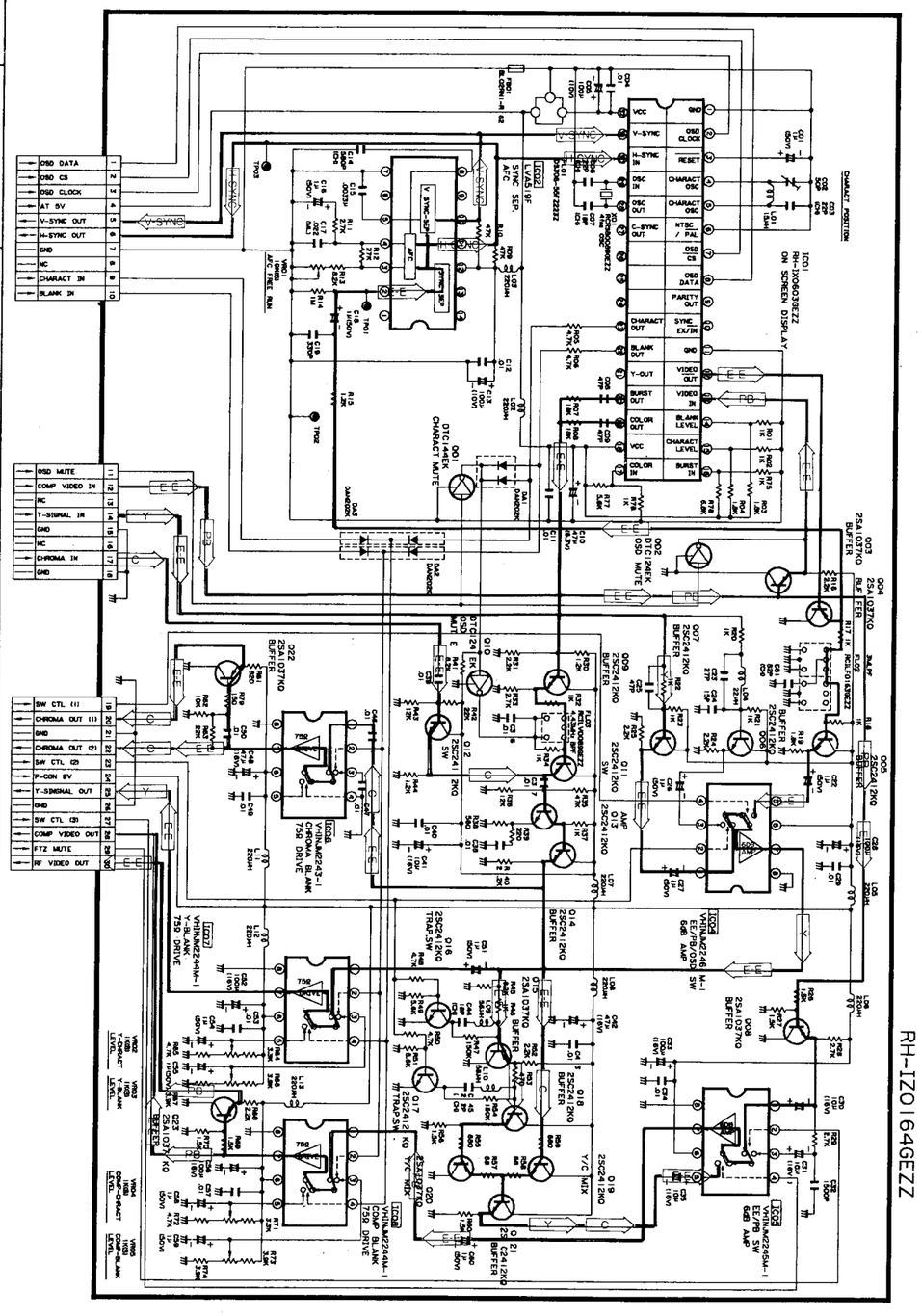
# NICAM CIRCUIT



## OPERATION CIRCUIT

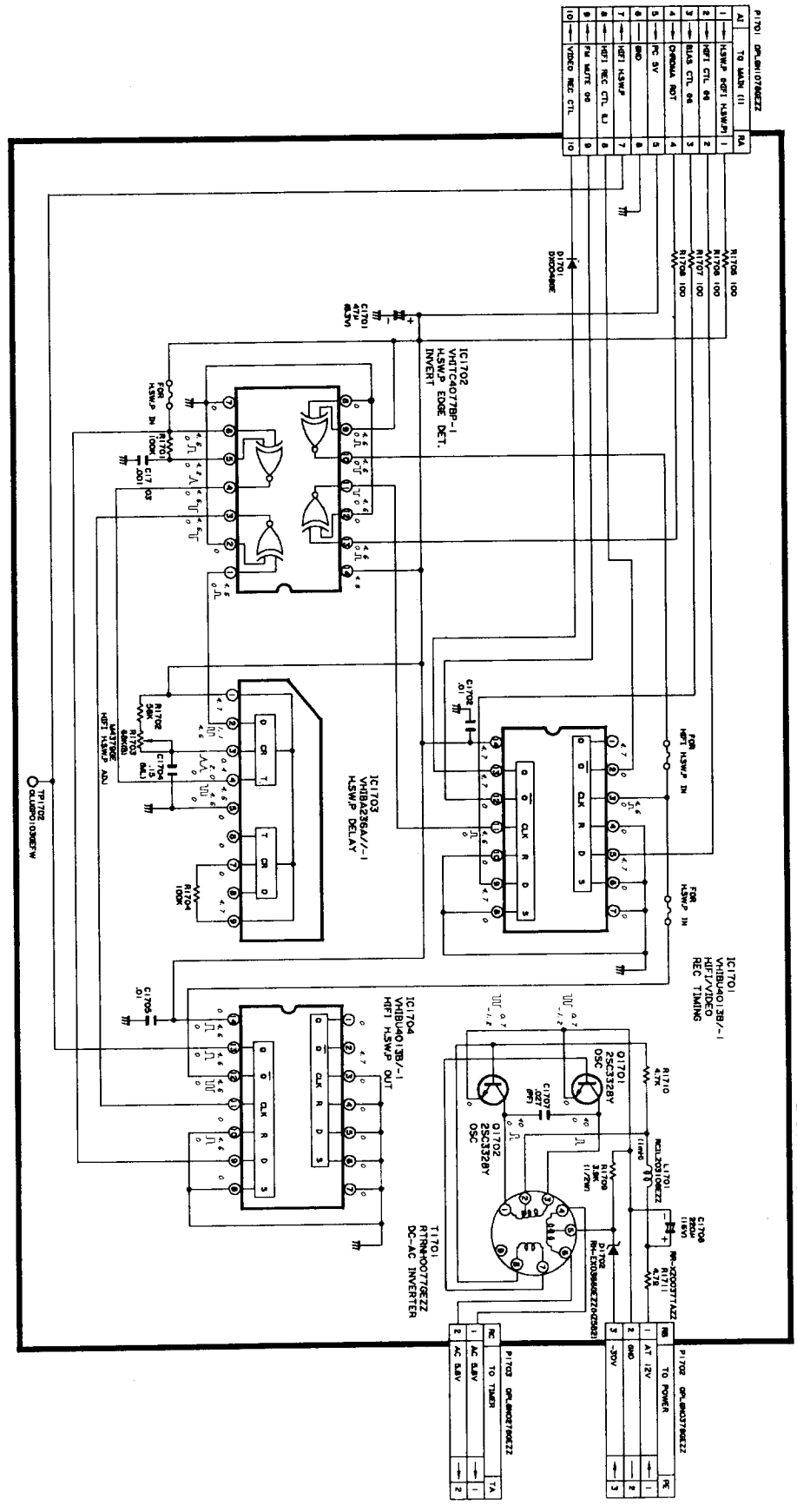



## ON-SCREEN DISPLAY CIRCUIT

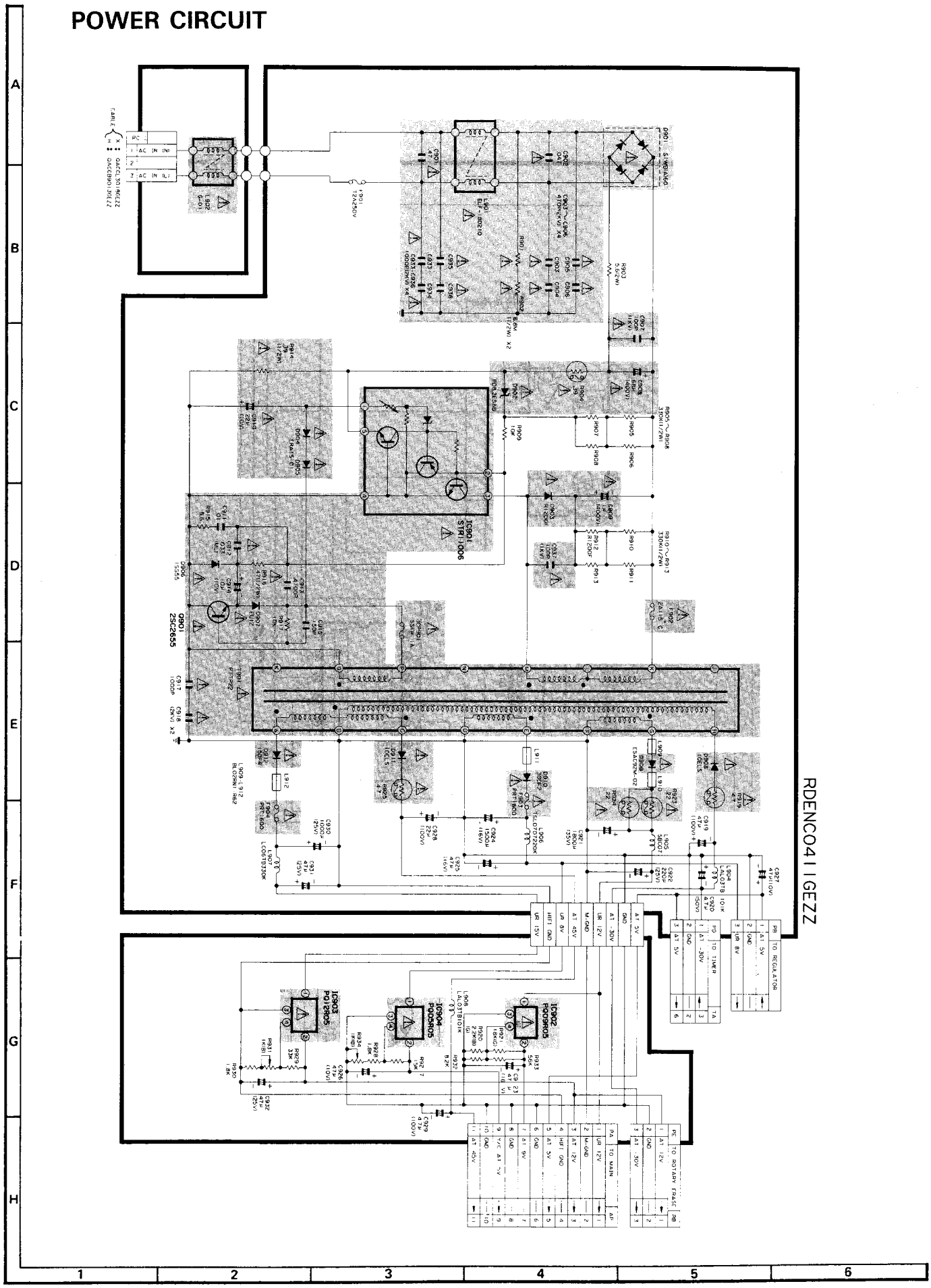



* VOLTAGE MEASUREMENT MODE
PB .....Parentheses ( )
REC .....Without Parentheses

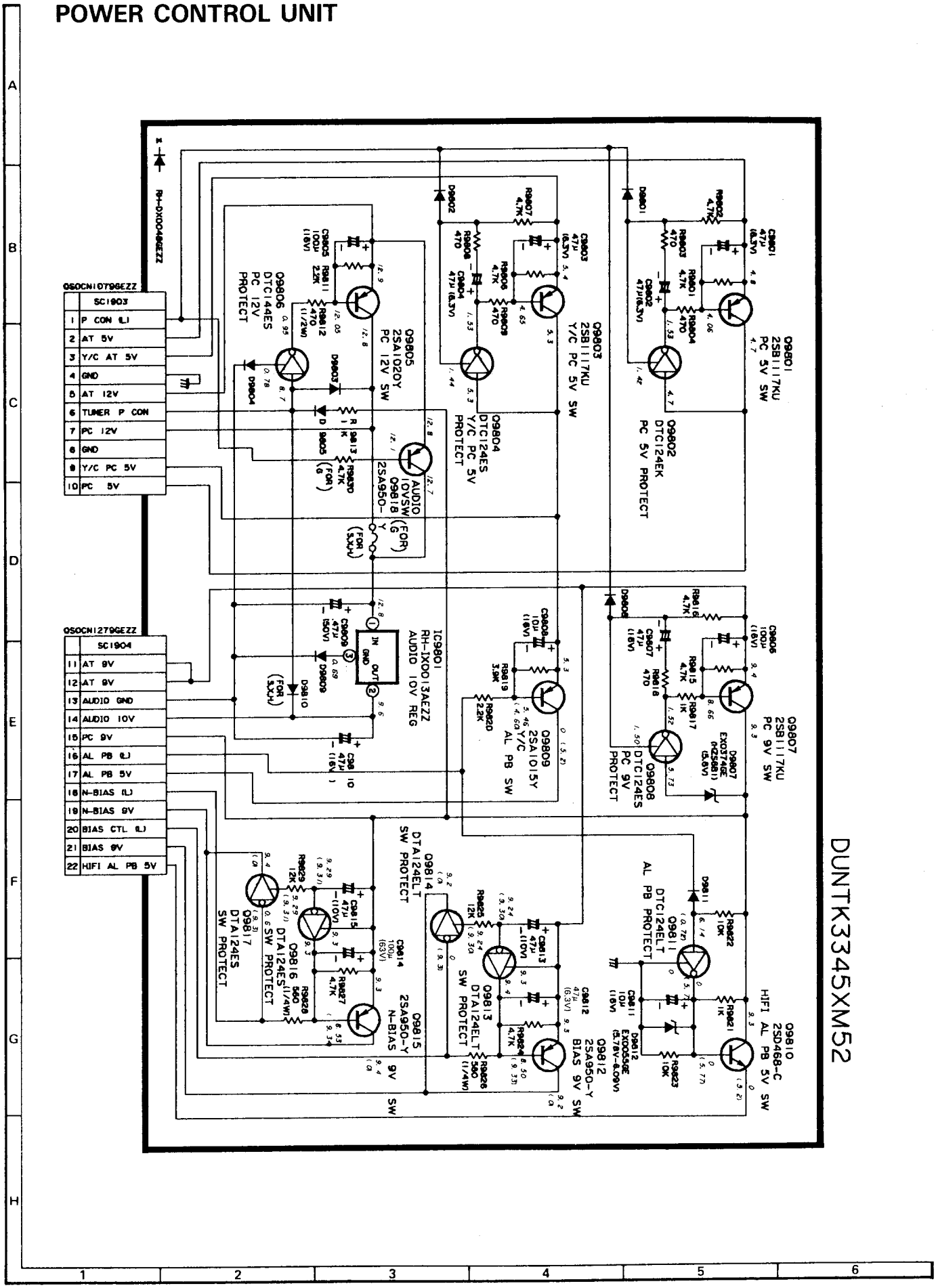
# ROTARY ERASE CIRCUIT



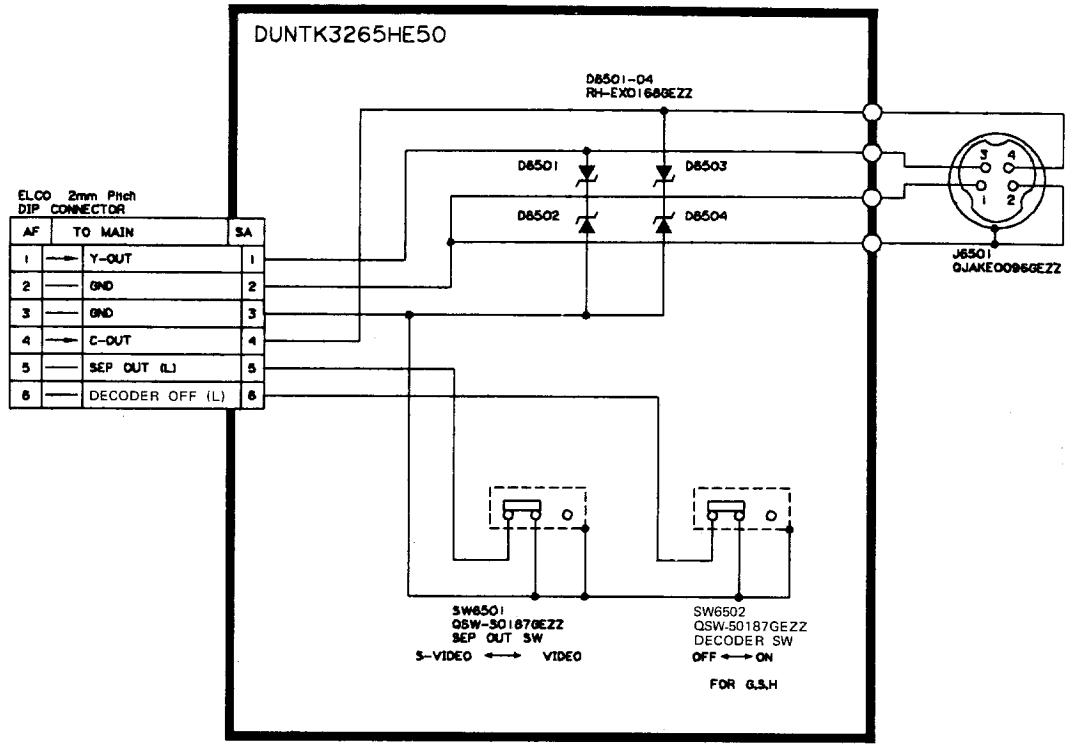
# POWER CIRCUIT



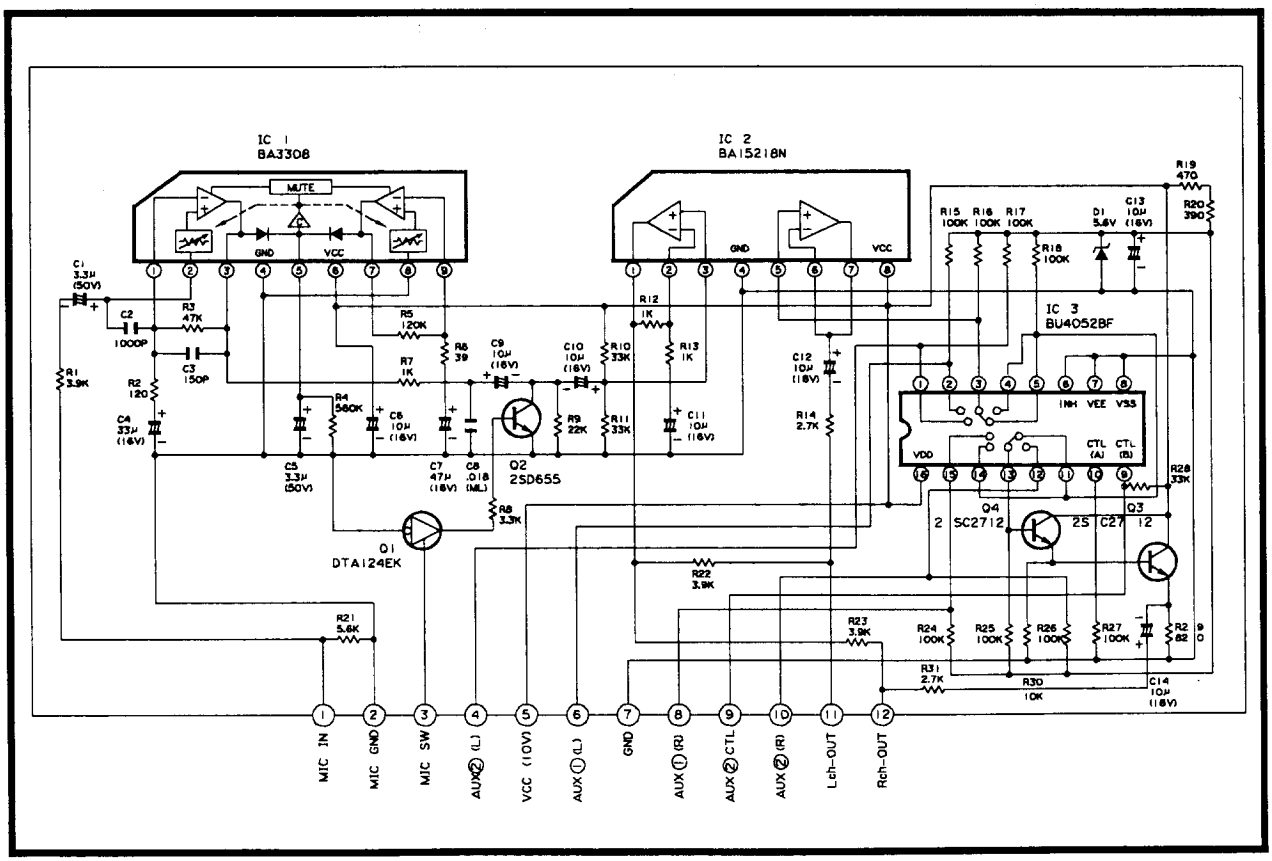
# POWER CONTROL UNIT



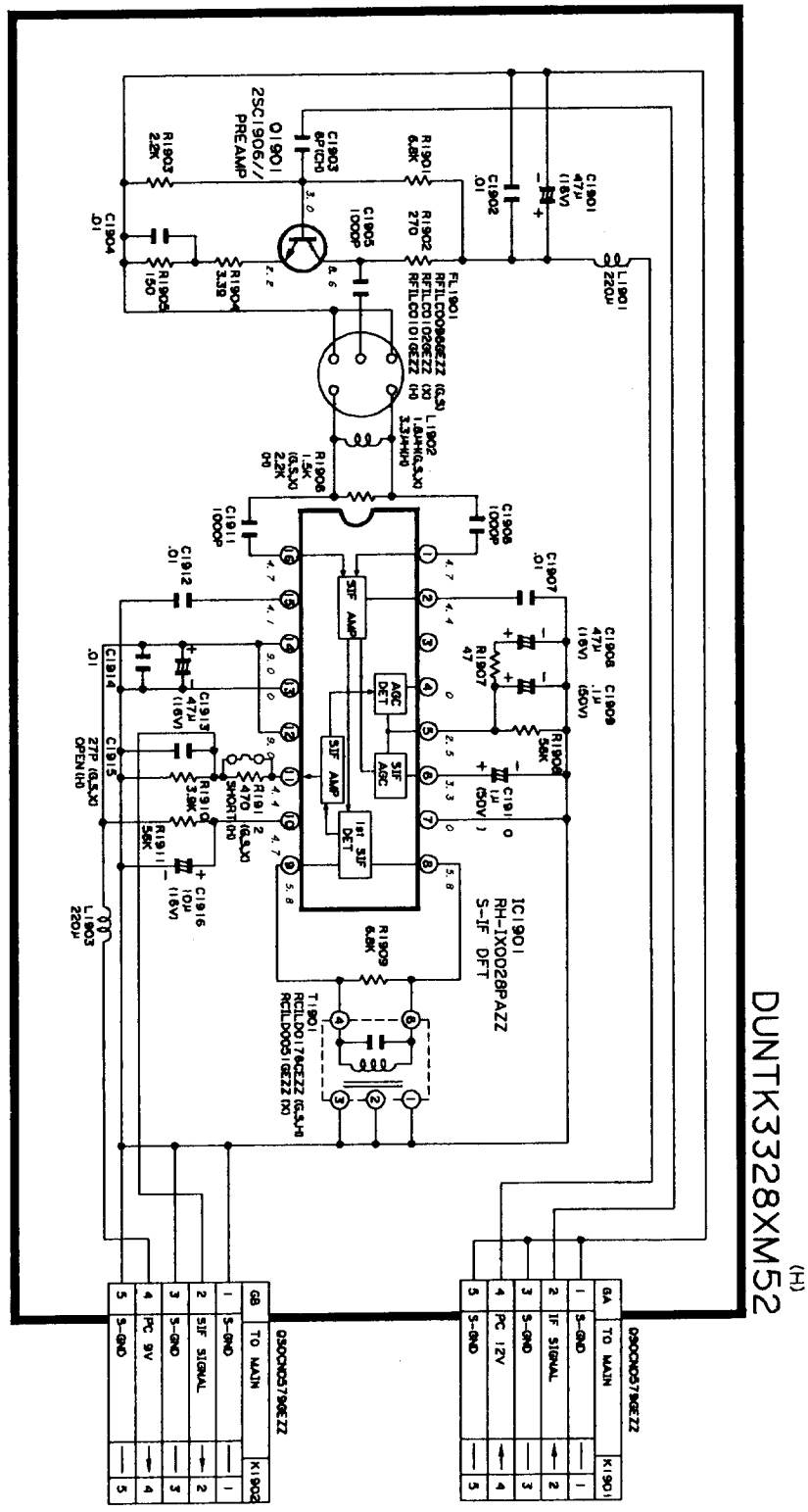
# S-TERMINAL/MIC MIXING CIRCUIT



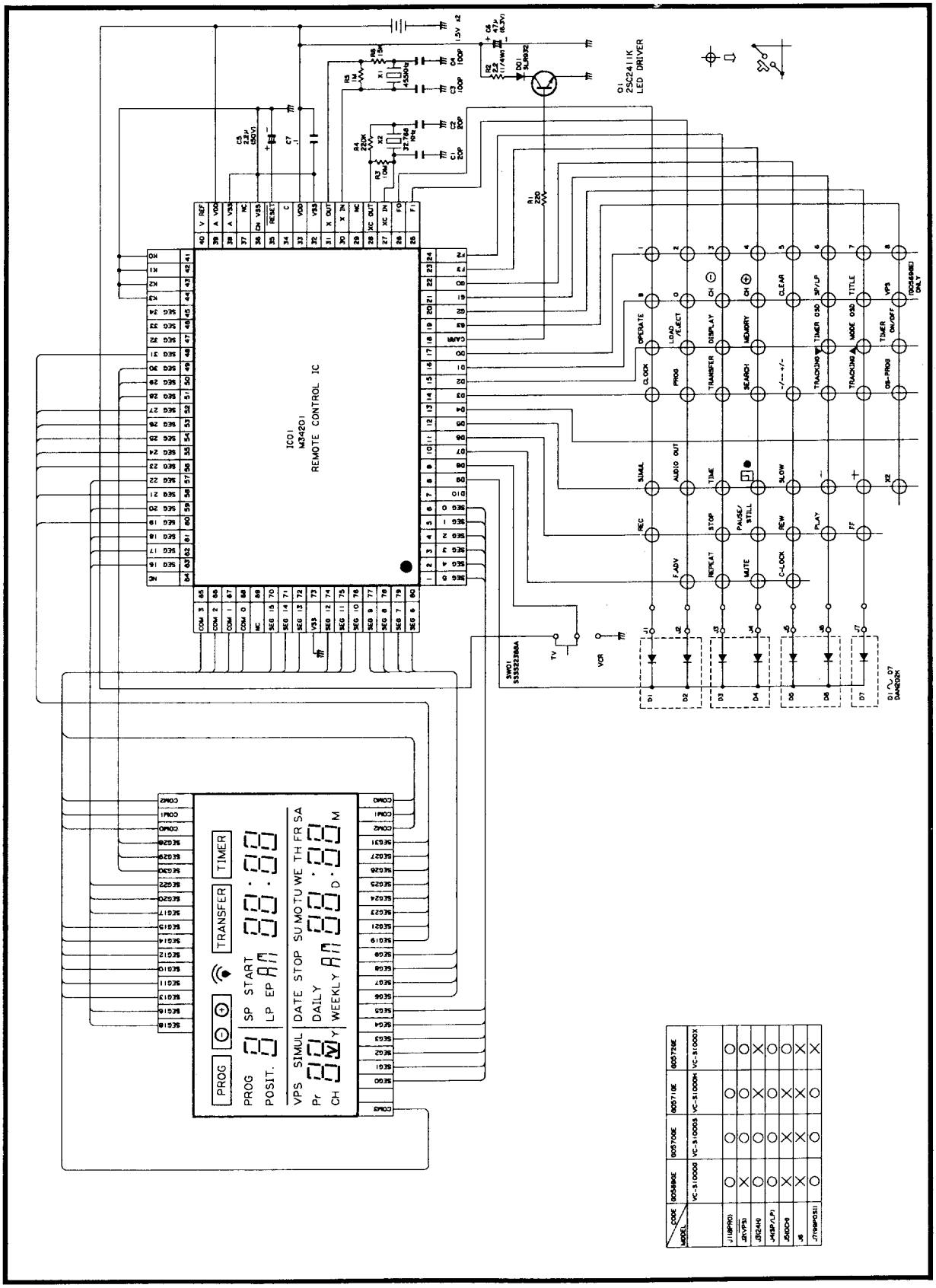

RH-IZ0156GEZZ



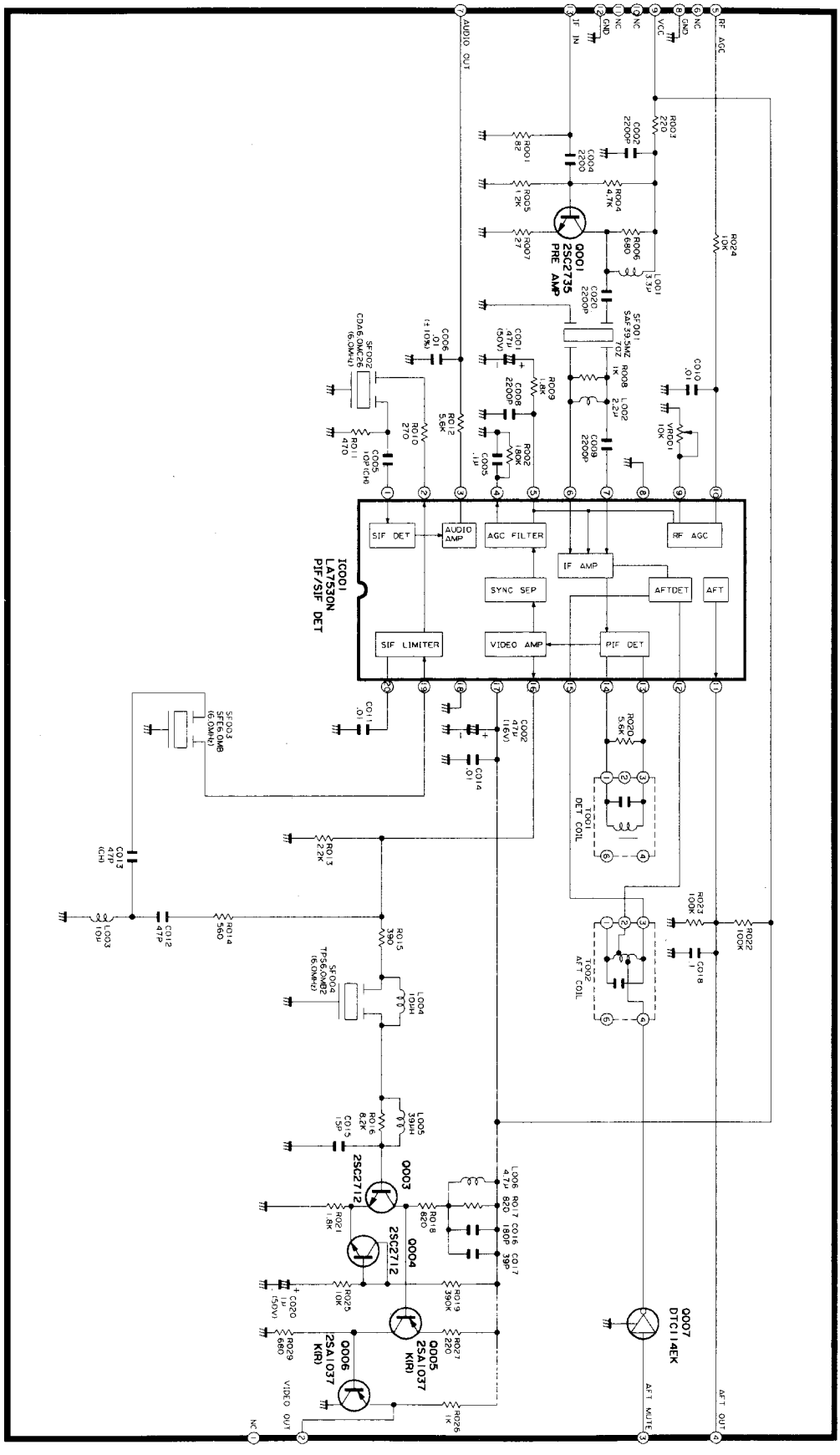
# SIF CIRCUIT


Q1901
2SC1906//
PREAMP
IC1901
RH-IX0028PAZZ
S-IF DET
SIF AMP
AGC DET
SIF AGC
1st DET
SHORT(JW)
TO MAIN
K1902
K1901
S-GND
SIF SIGNAL
PC 9V
IF SIGNAL
PC 12V
DUNTK3328XM52 (H)

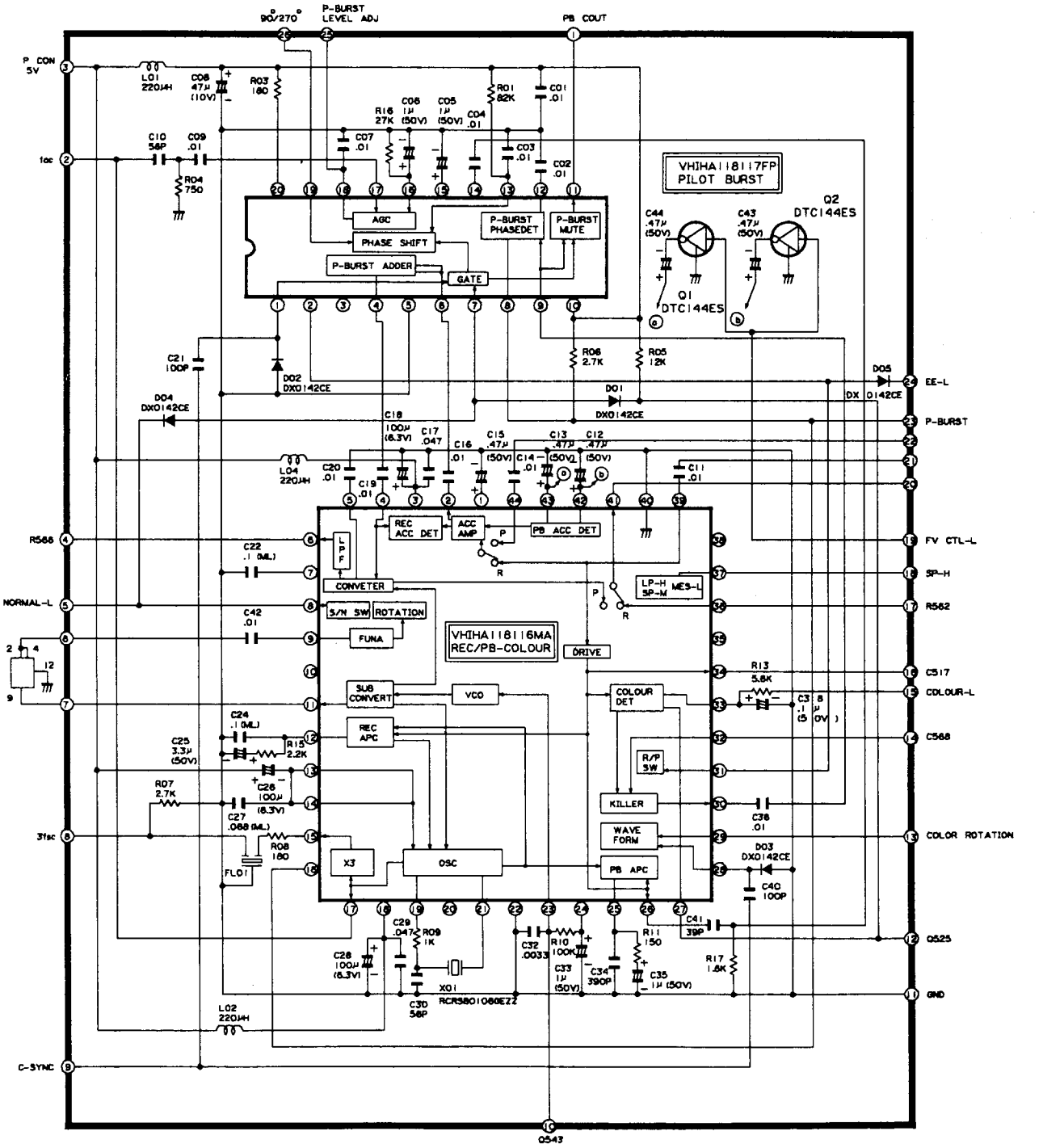
# INFRARED REMOTE CONTROL CIRCUIT

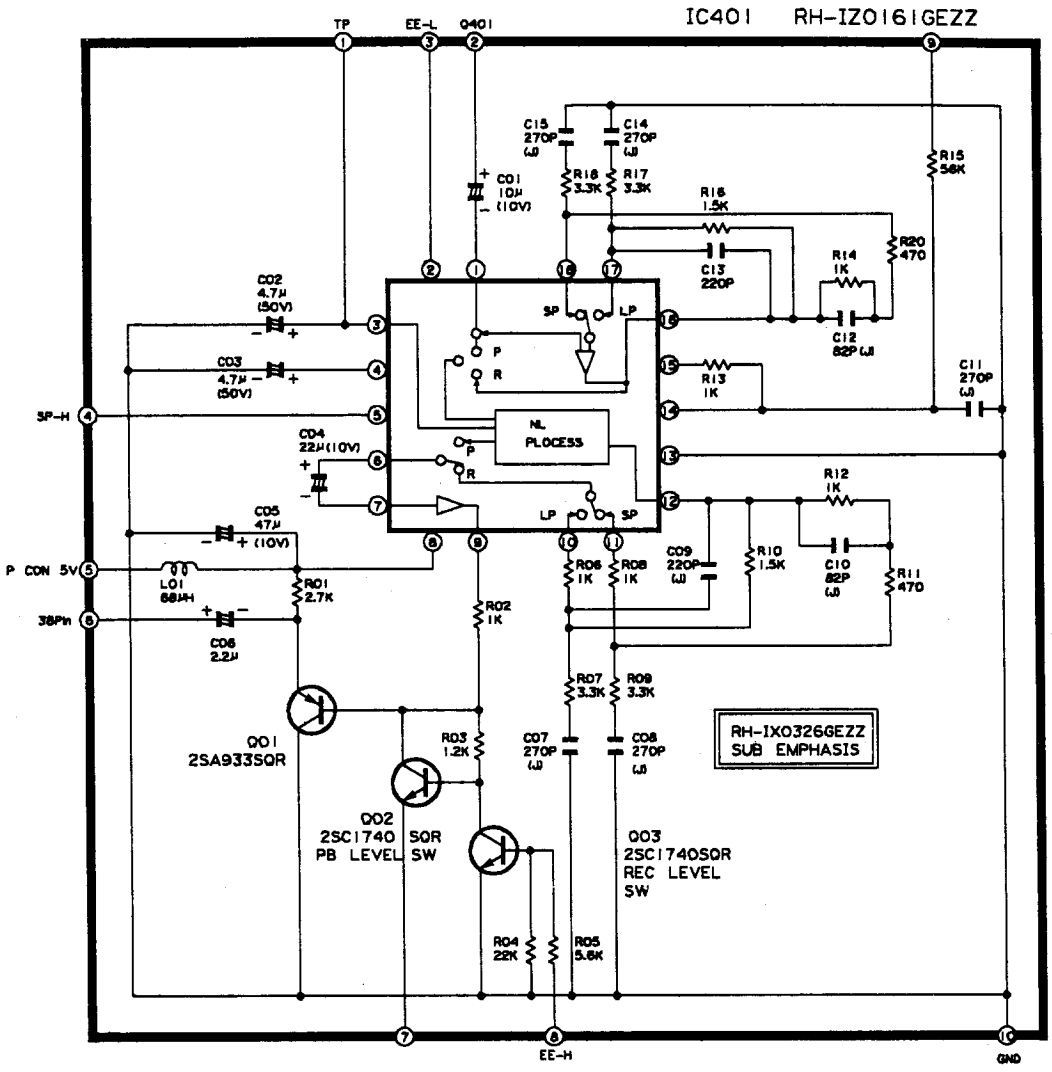


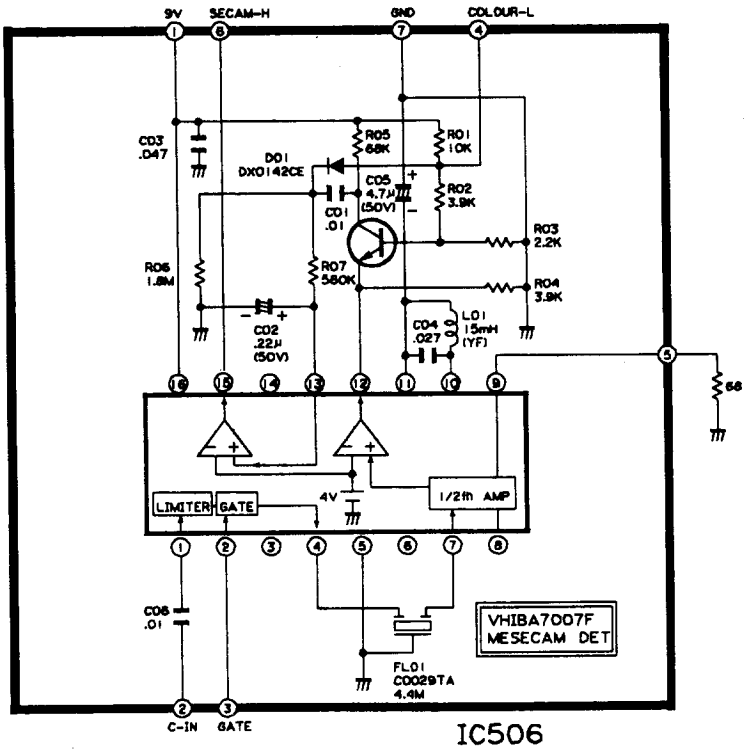
# IF PACK


AUDIO OUT
IF IN
GND
GND
NC
NC
VCC
GND
NC
RF AGC
Q001
2SC2735
PRE AMP
SIF DET
AUDIO AMP
AGC FILTER
RF AGC
IF AMP
SYNC SEP
AFTDET
AFT
SIF LIMITER
VIDEO AMP
PIF DET
IC001
LA7530N
PIF/SIF DET
T001
DET COIL
T002
AFT COIL
Q003
2SC2712
Q004
2SC2712
Q005
2SA1037
K(R)
Q006
2SA1037
K(R)
Q007
DTC114EK
VIDEO OUT
AFT MUTE
AFT OUT
NC

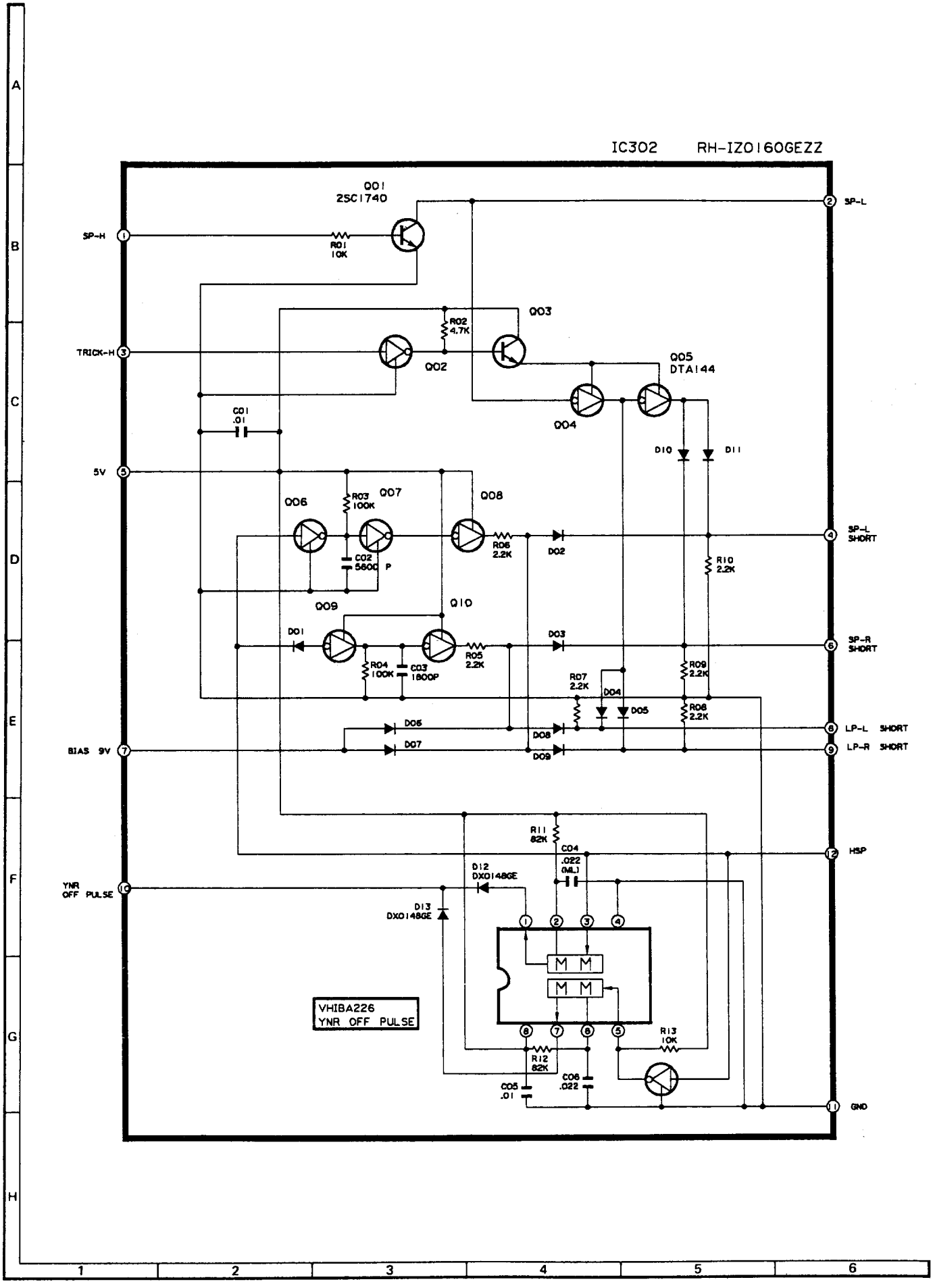
IC504
RH-IZ0157GEZZ






IC506
RH-IZ0158GEZZ


IC302 RH-IZ0160GEZZ
Q01 2SC1740
R01 10K
R02 4.7K
Q02
Q03
Q04
Q05 DTA144
C01 .01
D10
D11
Q06
R03 100K
Q07
Q08
C02 5600P
R06 2.2K
D02
R10 2.2K
Q09
Q10
D01
D03
R04 100K
C03 1800P
R05 2.2K
R07 2.2K
D04
D05
R09 2.2K
R08 2.2K
D06
D08
D07
D09
R11 82K
C04 .022 (M.)
D12 DX0148GE
D13 DX0148GE
VHIBA226
YNR OFF PULSE
R13 10K
R12 82K
C05 .01
C06 .022
SP-H
TRICK-H
5V
BIAS 9V
YNR OFF PULSE
SP-L
SP-L SHORT
SP-R SHORT
LP-L SHORT
LP-R SHORT
HSP
GND

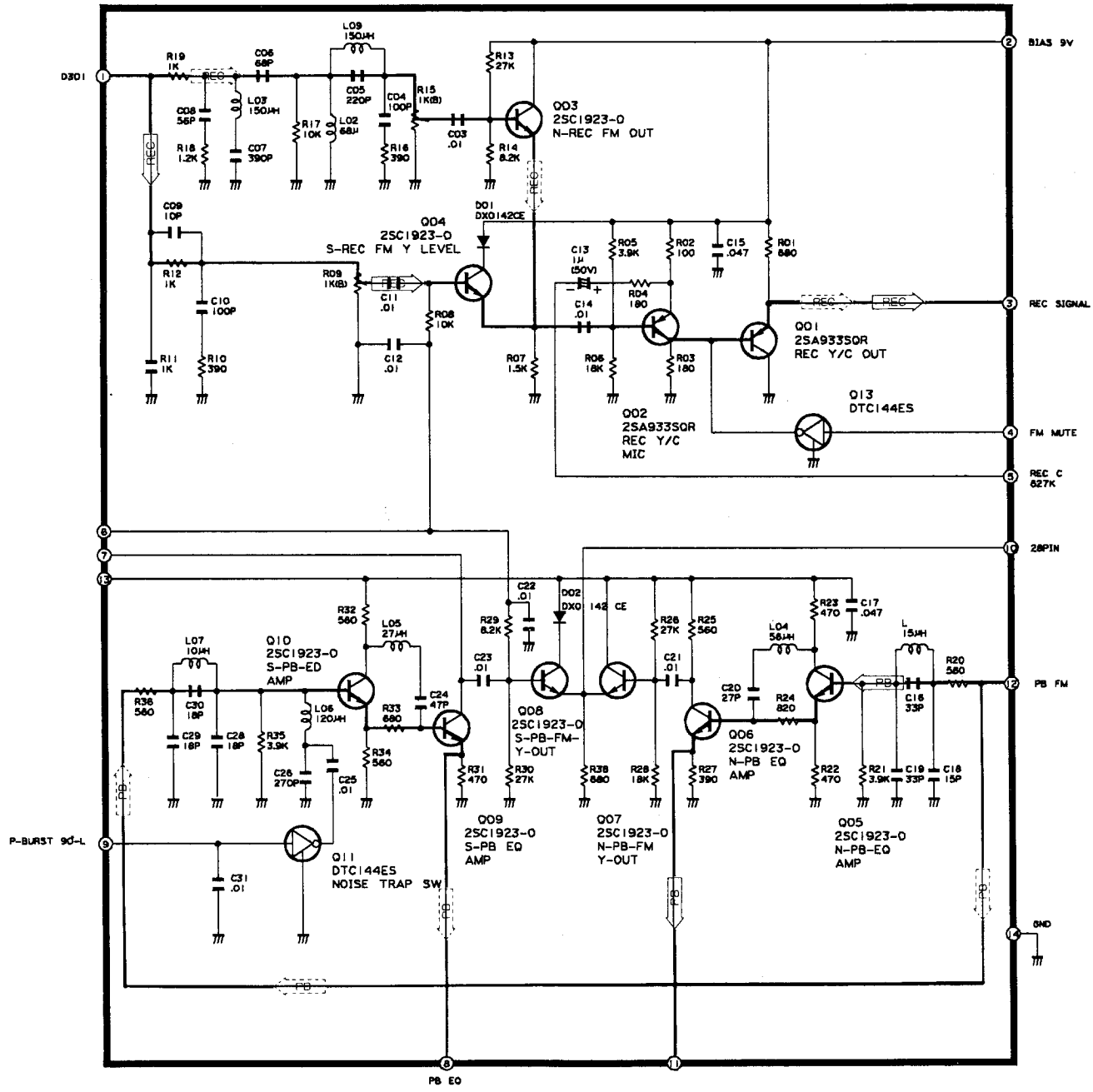
REC Recording FM Signal (VHS)

PB Playback FM Signal (VHS)

REC Recording FM Signal (S-VHS)

PB Playback FM Signal (S-VHS)

IC301
RH-IZ0159GEZZ



SHARP

# TECHNICAL FILE

## 10 SUPER V.H.S.

CONTENTS


| | | Page |
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| 4 | PILOT BURST | 5 |
| 5 | HEAD CONSTRUCTION | 8 |
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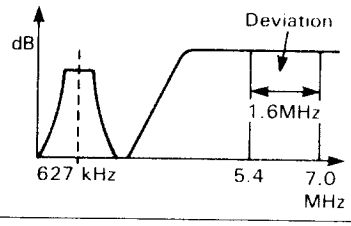
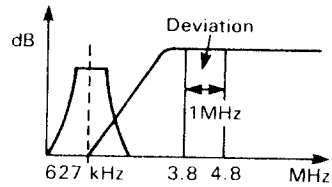
## SUPER V.H.S.

The V.H.S. recording system has been with us now for a number of years and has proved to be an excellent recording medium. The main criticism has been the inability to record very fine high frequency picture detail, this being due to recording limitations of luminance signal bandwidth. Althrough picture detail enhancing circuits have been added in recent years, HQ, picture quality improvement has been at the expense of additional noise content.

Significant advances in the electronics industry, manufacture of video heads, and availability of high quality video tape have made possible the introduction of the SUPER V.H.S. recording system. Similar in many ways to V.H.S., the S-V.H.S. recording system offers a considerable improvement in picture quality, having the capability of reproducing pictures containing very fine detail. The picture quality reproduced by a S-V.H.S. VCR is approaching that of the off air signal, also having the additional advantage of separate luminance and chrominance signal processing adds to the noise free S-V.H.S. quality pictures.

## COMPARISON OF S-V.H.S. AND V.H.S. SPECIFICATIONS

Below is given an outline of the main differences between the V.H.S. and S-V.H.S. recording systems.

| | S-VHS | VHS |
|---|---|---|
| Horizontal resolution | minimum 400 lines | minimum 250 lines |
| FM carrier (sync tip to white peak) | 5.4 to 7 MHz | 3.8 to 4.8 MHz |
| White clip | 110% | 80% |
| Dark clip | 70% | 40% |
| Spectrum |   |   |

### Horizontal Resolution.

Horizontal resolution is defined as being the maximum number of black to white transitions that can be reproduced by the television CRT as it is scanned by the electron beam. The maximum number of transitions is limited by the luminance signal bandwidth. The wider the bandwidth, higher frequency, the greater is the number of transitions or horizontal resolution, and therefore very fine picture detail can be reproduced.

Off Air T. V. broadcasts have a luminance signal bandwidth of 5.5MHz which equates to a horizontal resolution of 450 lines, or transitions. This means that the high frequency, fine picture detail can be reproduced by the T. V.

V.H.S. recorders have a luminance signal bandwidth of only 3MHz, thus all high frequency fine picture detail that would be represented by the higher frequencys is lost during the recording process. This gives the V.H.S. recorder a horizontal resolution of 250 lines. The inability of a V.H.S. recorder to reproduce the high frequency fine picture detail leads to a blurring effect on the screen where such detail would normally have been.

Since the introduction of the V.H.S. recording system there have been a number of developments that have increased the ability of a VCR to record and playback signals that contain fine detail. These have been a compromise of improved picture quality against increased picture noise.

To overcome the limtations of V.H.S. the SUPER V.H.S. recording system has been introduced. S-V.H.S. VCRs have a luminance signal bandwidth of 5MHz which has increased the horizontal resolution to 400 lines. With such a high horizontal resolution a S-V.H.S. VCR is capable of reproducing a picture the quality of which is approaching that of the off air signal.

### F M Luminance Carrier.

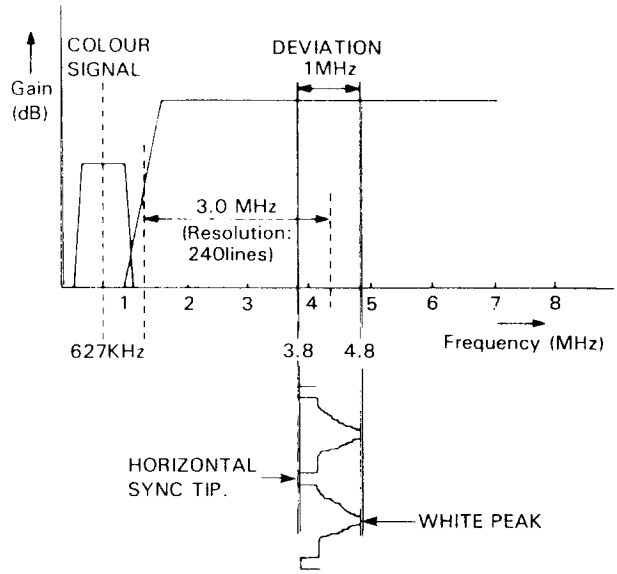
As previously stated S-V.H.S. recordings have a luminance signal bandwidth of 5MHz thus making V.H.S. and S-V.H.S. recordings incompatible. To accomadate this increased bandwidth a higher F.M. carrier is used, this is set to 5.4MHz as against 3.8MHz for V.H.S.

### Carrier Deviation.

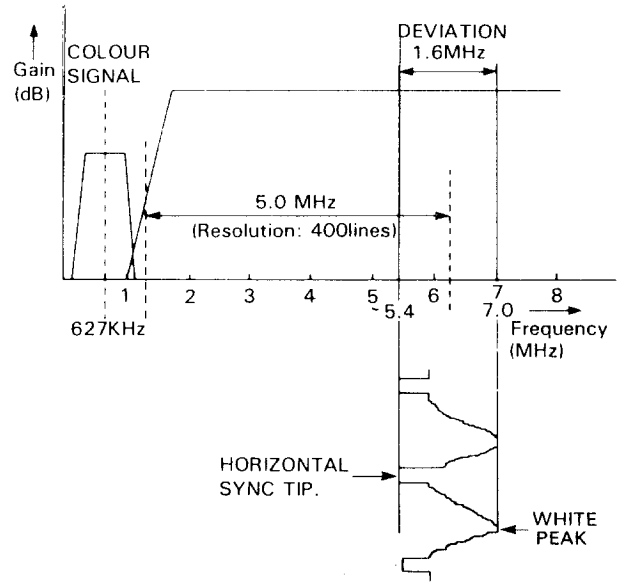
Due to the higher frequency of the luminance signal, the signal to noise ratio has to be improved. This has been achieved by increasing the F M carrier deviation from 1MHz, V.H.S., to 1.6MHz S-V.H.S. substantially increasing the signal to noise ratio.

### White-Dark Clip.

Additional sub-emphasis circuits are used when making S-V.H.S. recordings and because of this the white / dark clipping levels differ for V.H.S. and S-V.H.S. recordings.




**RECORDING SIGNAL SPECTRUM (VHS)**



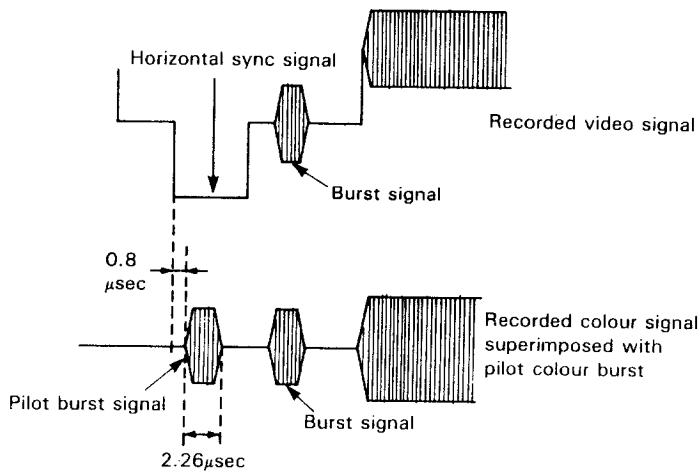

**RECORDING SIGNAL SPECTRUM (S-VHS)**

## CHROMINANCE RECORD SIGNAL

## PILOT BURST

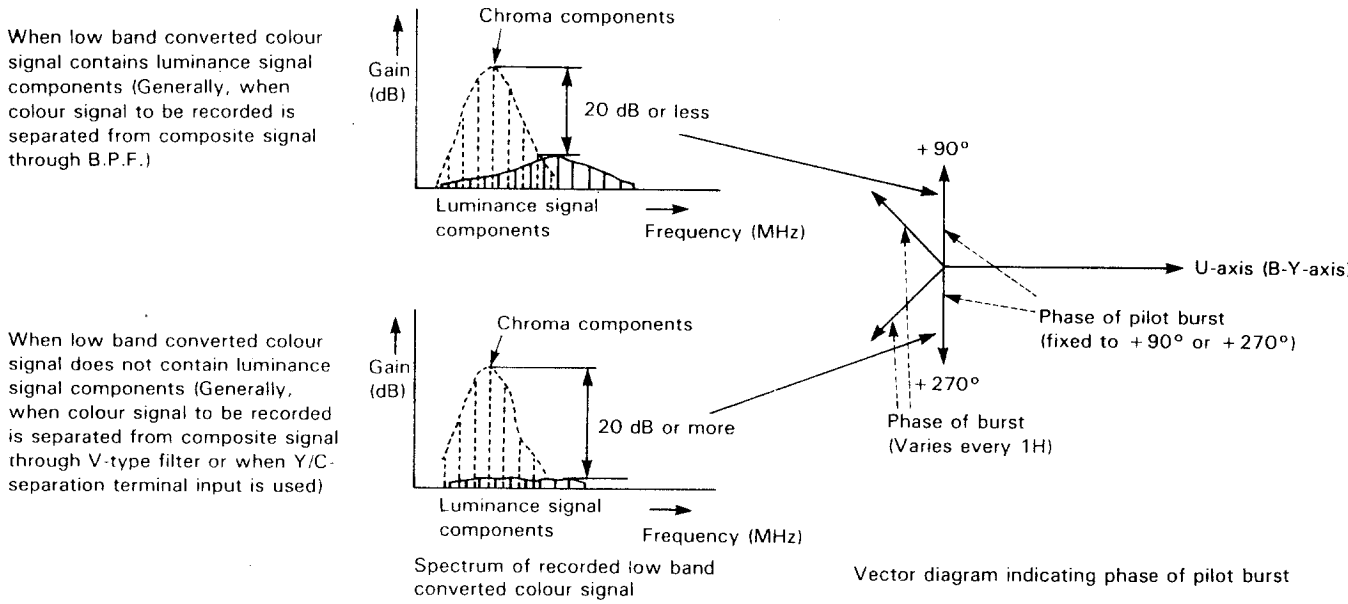
During the recording process of the chrominance signal it under- goes frequency conversion of the 4.43MHz carrier to 627kHz. This is achieved by mixing the 4.43MHz chrominance signal with a locally generated 5.06MHz signal and taking the difference, 627kHz, as the new chrominance signal for recording. To maintain the accuracy of the locally generated signal it is phase locked to the off air chrominance burst signal using an APC loop. The chrominance burst signal is not present during the vertical blanking period and it is possible for the locally generated 5.06MHz to drift leading to colour flicker during playback at the top of the screen as the APC locks. This effect is not noticeable when playing back a V.H.S. recording, but due to the improved picture definition would be noticeable when playing back a S-V.H.S. recording so therefore connot be allowed to happen.

To overcome the problem, caused by the absence of burst during the vertical blanking period, when making S-V.H.S. recordings the record chrominance signal has a signal called the PILOT BURST added during the horizontal sync pulse period. The pilot burst is added during the normal line scan period and also during the vertical blanking period. This maintains the stability of the locally generated signals and overcomes the problem of colour flicker at the top of the screen on playback.

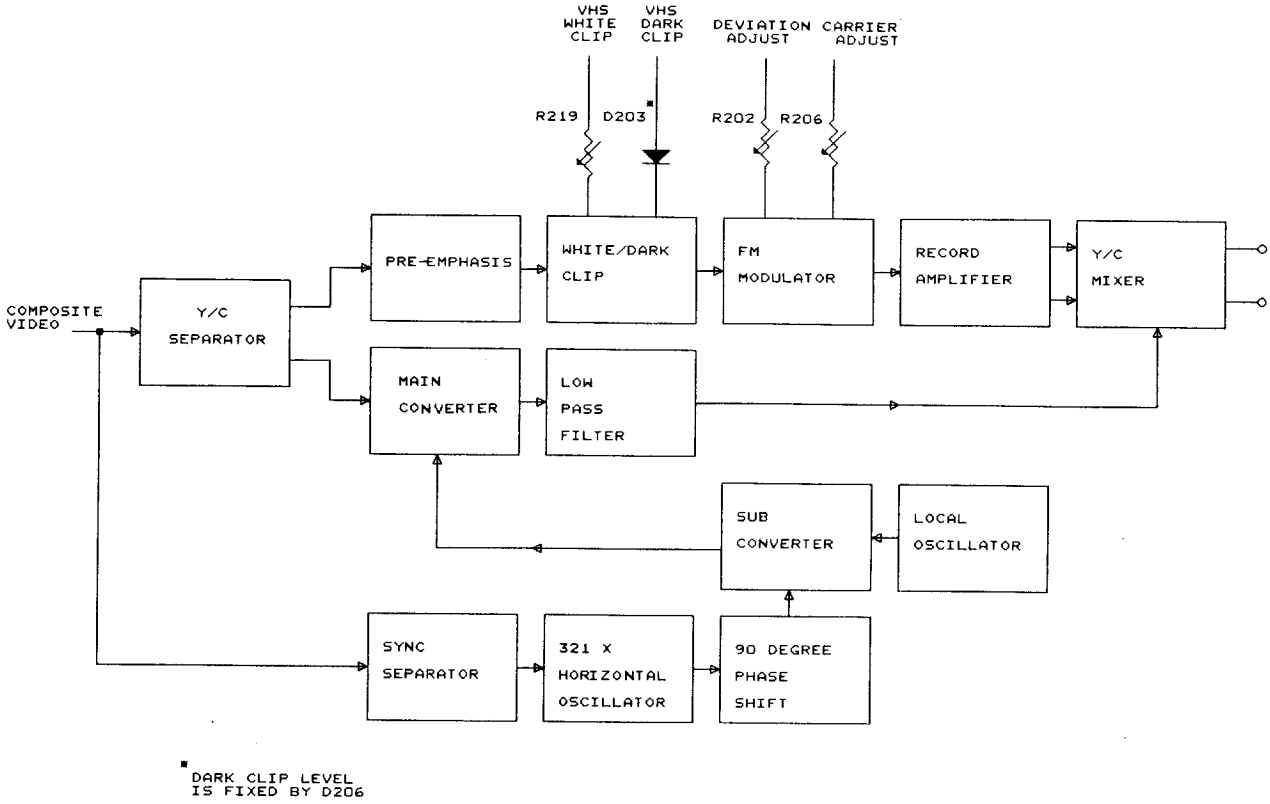



**PILOT BURST**

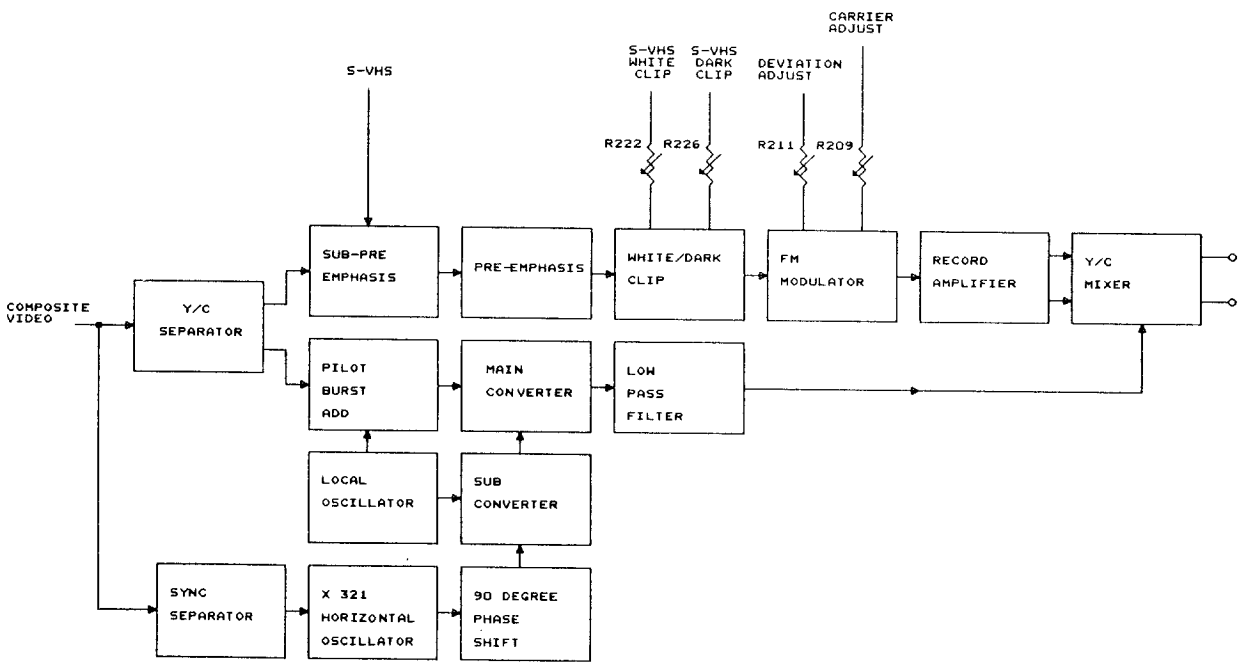
The pilot burst has the same frequency, 4.433619MHz, and amplitude as the off air chrominance burst signal. Pilot burst is generated and added to the record chrominance signal automatically when making S-V.H.S. recordings. During playback the pilot burst is used to maintain the stability of the APC loop, once this has been achieved then the pilot burst is erased, so is not outputted to the TV reciever. Unlike the off air chrominance burst the pilot burst is not subjected to phase variations line by line, but it can be recorded in one of two phases, +90 deg or +270 deg, with respect to the U axis. The phase of the pilot burst is dependent upon the type of Y/C separation circuitry used, a simple band pass filter or a more sophisticated 2 H delay, comb filter. The phase of the pilot burst is used to indicate if there is luminance signal noise mixed with the chrominance signal.


When low band converted colour signal contains luminance signal components (Generally, when colour signal to be recorded is separated from composite signal through B.P.F.)
Chroma components
Gain (dB)
20 dB or less
Luminance signal components
Frequency (MHz)
When low band converted colour signal does not contain luminance signal components (Generally, when colour signal to be recorded is separated from composite signal through V-type filter or when Y/C-separation terminal input is used)
Chroma components
Gain (dB)
20 dB or more
Luminance signal components
Frequency (MHz)
Spectrum of recorded low band converted colour signal
+90°
U-axis (B-Y-axis)
Phase of pilot burst (fixed to +90° or +270°)
+270°
Phase of burst (Varies every 1H)
Vector diagram indicating phase of pilot burst

**PHASE OF PILOT BURST**



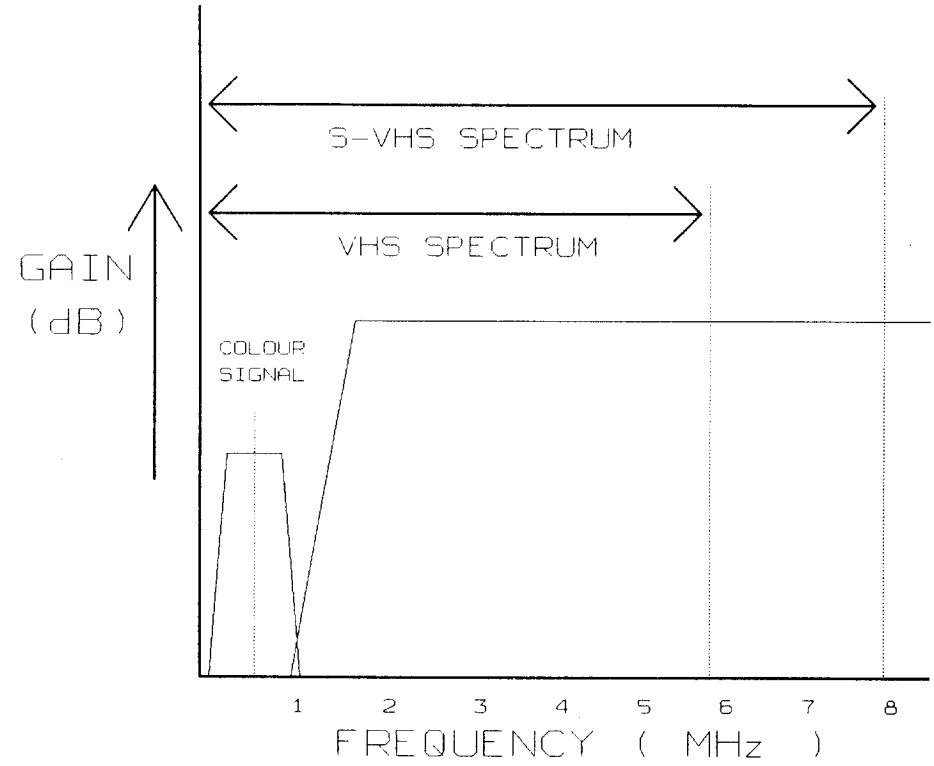

## BLOCK DIAGRAM V.H.S. RECORD




## BLOCK DIAGRAM S-V.H.S. RECORD

## VIDEO HEAD CONSTRUCTION

The recording spectrum of a V.H.S. VCR extends from 0 to 5.8MHz taking into account the upper sideband of the luminance signal. To achieve this spectrum a video head gap of 3uM is required. The recording spectrum of a S-V.H.S. VCR has a recording spectrum of 8MHz which exceeds the extinction frequency of a 3uM head gap. The video head gap has therefore been reduced to allow S-V.H.S. recordings to be made. (Approximatly 2uM)

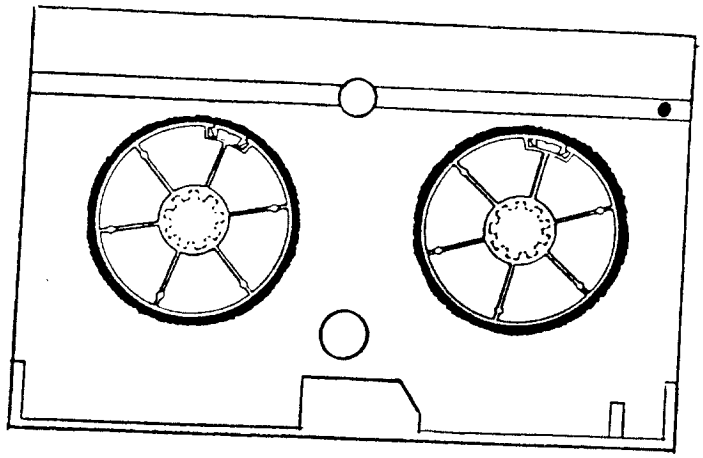



## S-V.H.S. TAPE

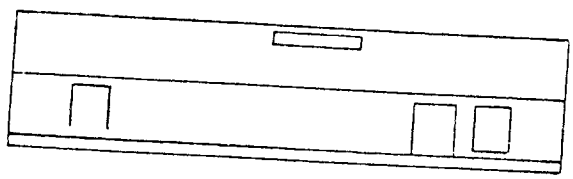
The recording ability of any VCR depends ultimately upon having a tape capable of recording the high frequency luminance signal. Therefore because S-V.H.S. recording format has a signal bandwidth of 8MHz a new higher quality tape has had to be introduced. The new tape has a coating of a formulation of Cobolt Ferric Oxide with very fine particles. This tape has been especially developed for the S-V.H.S. recording format and offers superior recording characteristics at the much higher frequencys.

## TAPE IDENTIFICATION

As part of the S-V.H.S. specification all S-V.H.S. VCRs manufactured will be duel standard, ie V.H.S. / S-V.H.S. It is therefore necessary that the VCR knows which type of tape has been inserted so it can adopt the correct mode of operation. S-V.H.S. cassettes have the same physical size as V.H.S. cassettes so some form of identification is built into the construction of the cassette case. In the case of the full size cassette there is the inclusion of a small hole on the under side of the cassette. A compact 'C' type cassette for use in cam-corders has an identification slot on its back edge opposite the record protection tab. When a cassette is inserted the hole or slot is detected and the appropriate mode of opperation selected.



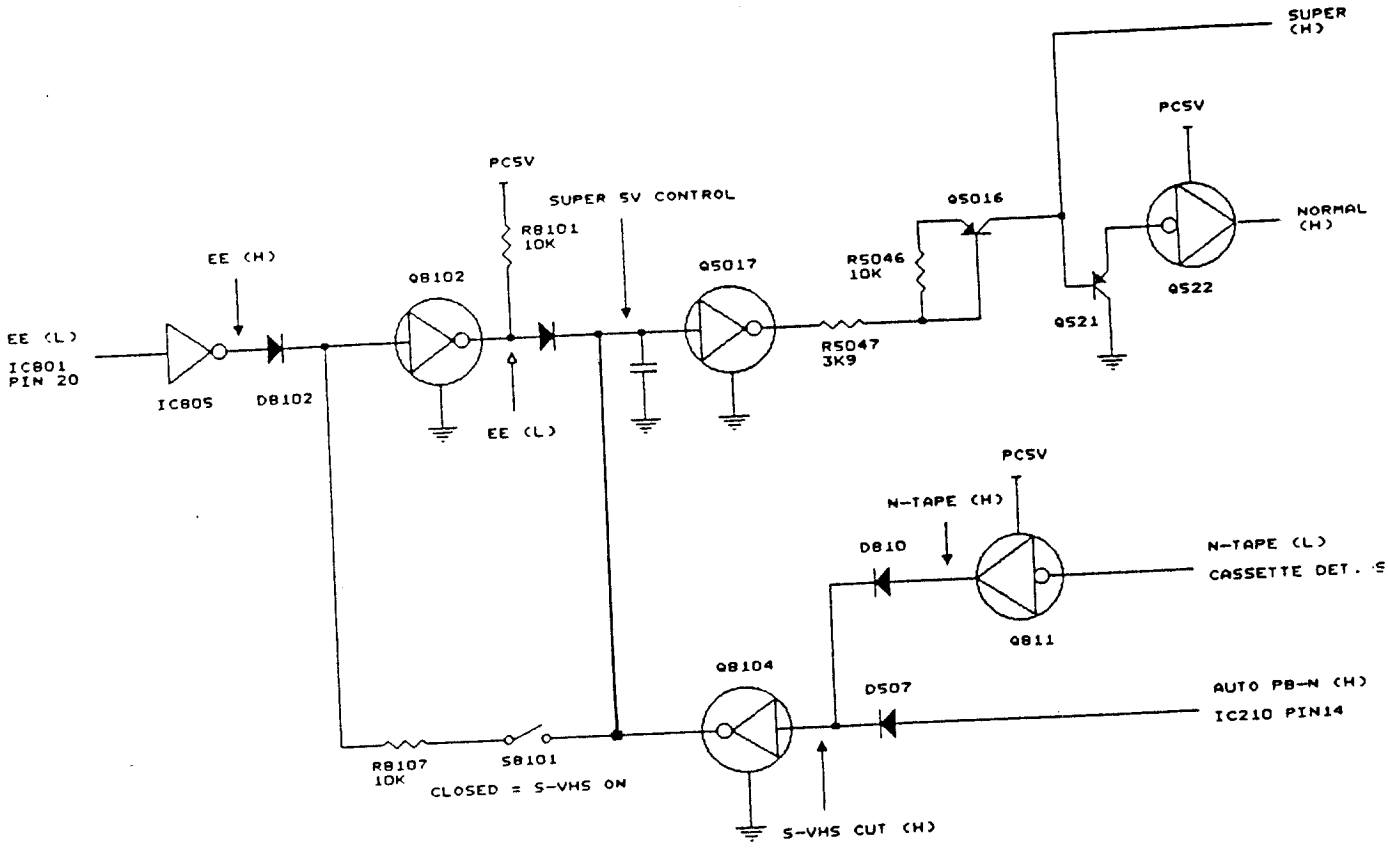
**FULL SIZE CASSETTE**



**"C" FORMAT**

During playback of a S-V.H.S. recording the mode of operation can also be selected by detection of the luminance signal carrier frequency irrespective of the manual AUTO/OFF switch.

## VC-S1000 CASSETTE DETECTION CIRCUIT




S-V.H.S. recordings can only be made when the S-V.H.S. AUTO/OFF selector, mounted on the front panel, is switched to the AUTO position. When playing back a S-V.H.S. recording with the switch in the off position, S-V.H.S. mode is selected due to detection of the luminance signal carrier frequency.

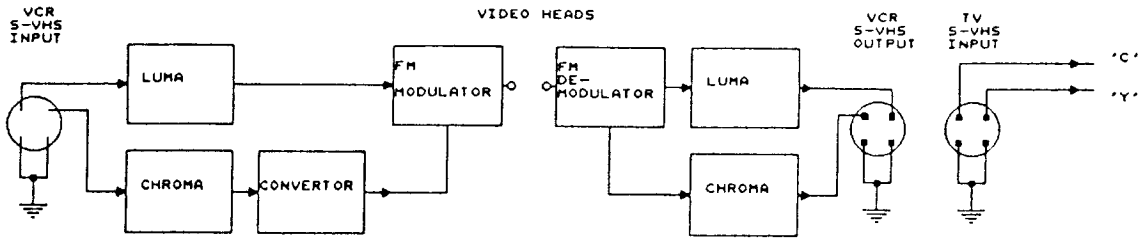
A low output from pin 14 of IC201, the luminance signal processer, is inverted by Q8104 and via Q5017 is used as base bias for Q5016 thus enabling a Super High 5v line.

## S-V.H.S. CASSETTE DETECT SWITCH

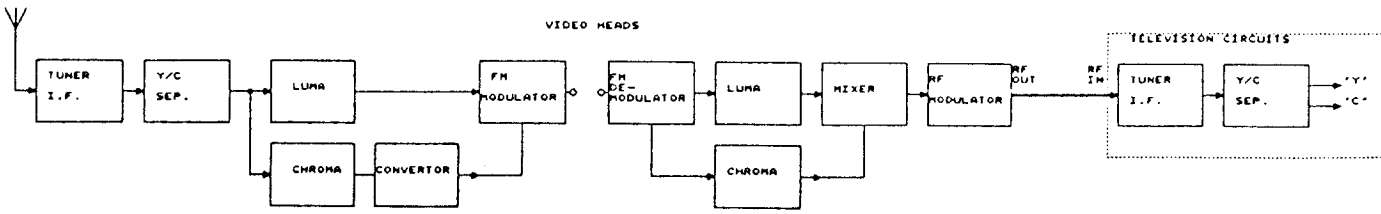
The S-V.H.S. cassette detect switch is mounted on the main chassis directly below the rear right corner of the cassette. When a V.H.S. tape is inserted the switch is closed and the super 5v line is inhibited. When a S-V.H.S. tape is inserted the switch remains open and the super 5v line remains constant.

## S-V.H.S. TERMINAL

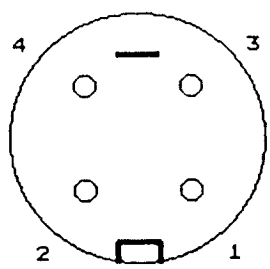
During the normal recording / playback of a V.H.S. VCR the luminance and chrominance signals pass through several stages of processing. All of these processes could add noise to the wanted signals and reduce the quality of the reproduced picture.




To overcome the possibillty of noise generation a S-V.H.S. VCR is fitted with additional terminal at the front and rear. Via this terminal separate luminance and chrominance signals are directly inputted and outputted, missing out the noise generating IF/RF modulator stages of the VCR. When connected to a suitably equipped TV the reproduced picture does not suffer from additional noise.




The round S-V.H.S. terminal has four pin connections and can be used to either input or output signals but not both from the same terminal. The pin connections are shown below.




Pin 1 Y Ground
Pin 2 C Ground
Pin 3 Y Signal
Pin 4 C Signal

The VC-S1000 features S-V.H.S. recording, NICAM digital stereo sound decoder, HI FI sound recording, flying erase head, audio dubbing and much more making it one of the most advanced domestic VCRs available. The remainder of this technical file will concentrate upon the circuitry employed in S-V.H.S. recording and playback.

## RECORD SIGNAL SELECT

The VC-S1000 is equipped with two auxiliary terminals and S- V.H.S. terminals. It has to be possible to switch between these signal supplies and the off air signal for recording. Selection of the signal to be recorded is carried out by IC4404 and IC4405. Each has three signal inputs and two control lines. IC4405 also has the playback mute control line applied to it. The signal input sources are given below.

| | |
|---|---|
| 1/ AV1 | 21 pin Scart socket at rear. |
| 2/ AV2 | Camcorder input on front facia. |
| 3/ S-V.H.S. | Input Terminal mounted on front facia. |
| 4/ Off Air | Normal R F signal. |

## IC 4405

IC4405 has signal inputs from AV1, AV2 and composite video from the IF decoder applied to it. Selection of which signal is to be outputted is carried out by the two control lines, TUN-H and AUX2-H.

## IC 4404

IC4404 has signal inputs from IC4405, whichever signal has been outputted, AV2, which is also connected to IC4405, and the separate Y signal from the S-V.H.S. input terminal. The control lines used to select the output signal are SEP-IN 5v and DECODER ON/OFF.

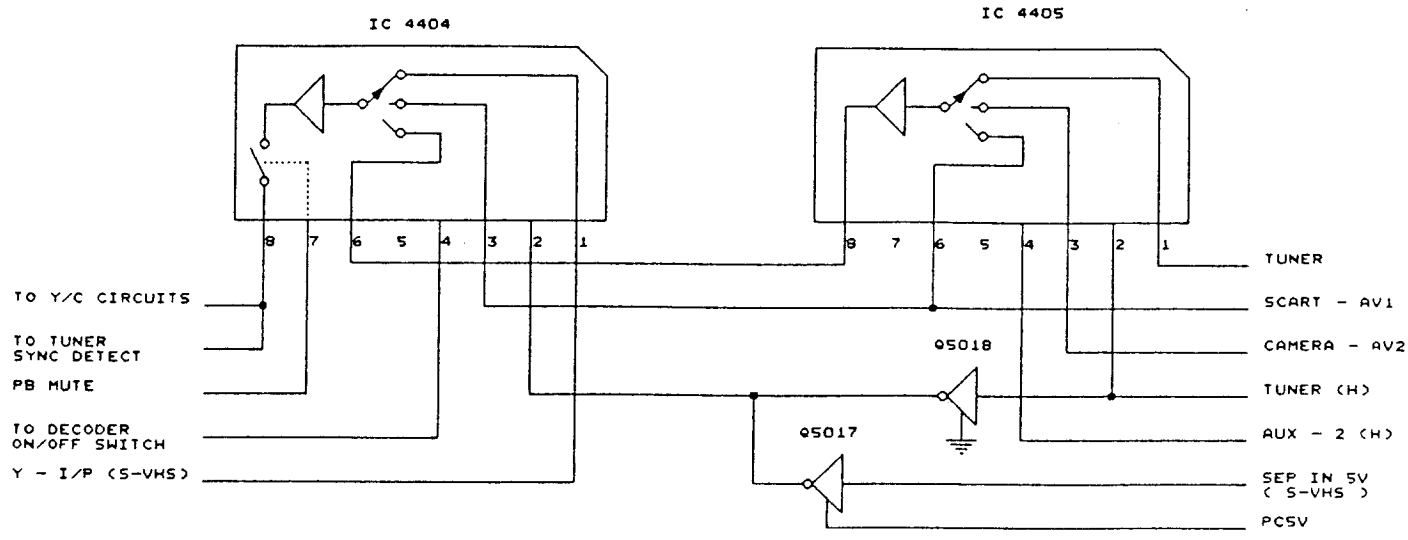
## SEP-IN 5v

The SEP -5v control line becomes active whenever signals are connected to the S-V.H.S. input terminal. Switch 5101, part of the S-V.H.S. terminal, is closed whenever a S-V.H.S. lead is connected.

## DECODER ON/OFF

The decoder on/off switch should be activated whenever a satellite system that has an additional decoder is to be connected. When active the satellite RF signal, connected via the RF input, is switched to pin 19 of the scart socket. This should be connected to the decoder. The signal once decoded is inputted back to the VCR at pin 20 of the scart socket. When connected in this manner the VCR has to be placed in the SIMUL-CAST mode by pressing the button on the remote control. This then activates a number of switches that ensure correct routing of the signal.

## SIGNAL INPUT SELECT

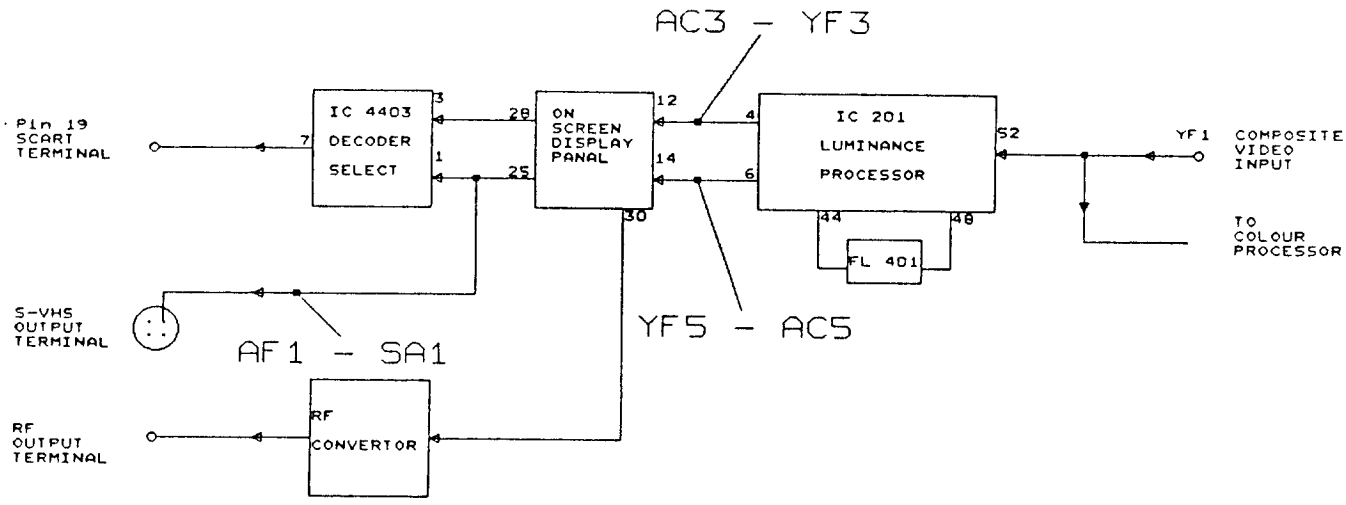



| SEP 5V | DECODER ON/OFF | OUTPUT |
|---|---|---|
| L | L | IC4405 |
| H | L | S-VHS Y |
| H | H | AV2 - SCART |

| TUNER (H) | AUX - 2 (H) | OUTPUT |
|---|---|---|
| L | L | AUX 1 |
| H | L | TUNER |
| L | H | AUX 2 |

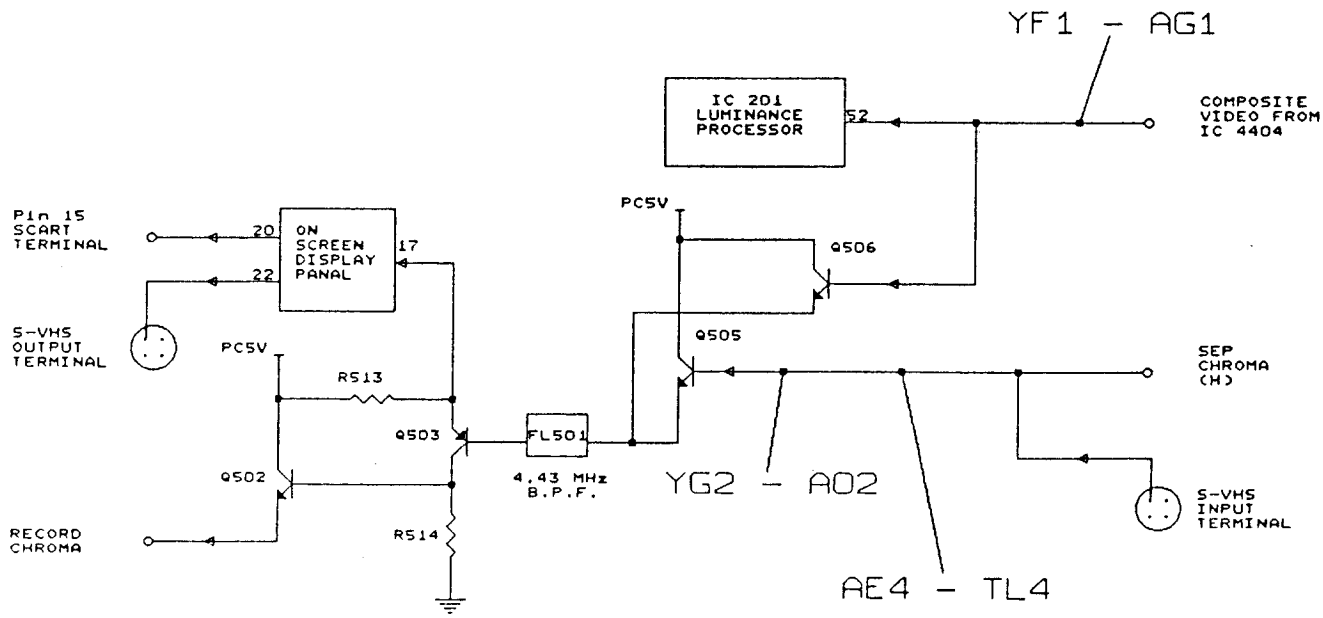
## LUMINANCE E/E PATH

Once selected the output signal of IC4404 is connected to pin 52 of IC201 the luminance processing chip and also to the chrominance processing circuits. The composite video E/E signal output from pin 4 of IC201 and then passed through the O.S.D.,On Screen Display, panel. The E/E signal is outputted at pin 30 and connects to the RF converter. From pin 28 of the O.S.D. panel the signal is connected to a decoder switch, IC4403, this switches the signal to pin 19 of the scart socket when the decoder switch is turned ON, normally a separate luminance signal is outputted at pin 19. From pin 48 of IC201 the composite video is passed through a chrominance filter and the remaining luminance is connected back to pin 44 of IC201. A separate Y signal is outputted at pin 6 and connected through the O.S.D. panel to the S-V.H.S. out terminal at the rear of the VCR.



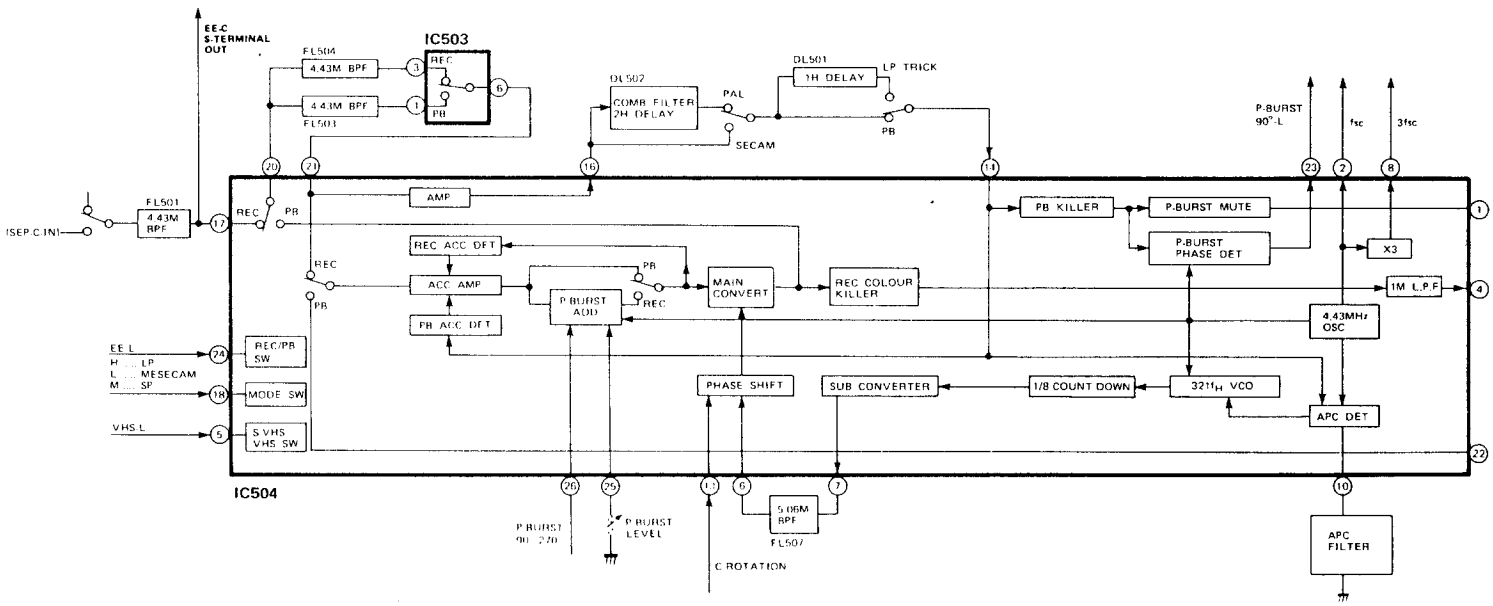
## CHROMINANCE E/E PATH AND SEPARATE CHROMINANCE PROCESSING

A separate chrominance signal is available at the S-V.H.S. out terminal and pin 15 of the scart socket during the E/E mode. Inputted to the chrominance processing circuit is composite video and a separate chrominance signal from the S-V.H.S. input terminal. Selection of which signal is to be processed is carried out by Q505 under the control of the SEP CHROMA-H line. When the transister is on the separate chrominance signal is selected, the separate Y signal is selected by the input select switch ICs. When the transister is off the composite video signal is selected. The signal now passes through chrominance BPF ,FL501, and onto the OSD panel. The output from the OSD is pin 22 and this separate chrominance signal to the S-V.H.S. terminal and output from pin 20 is a separate chrominance signal to pin 15 of the scart socket.



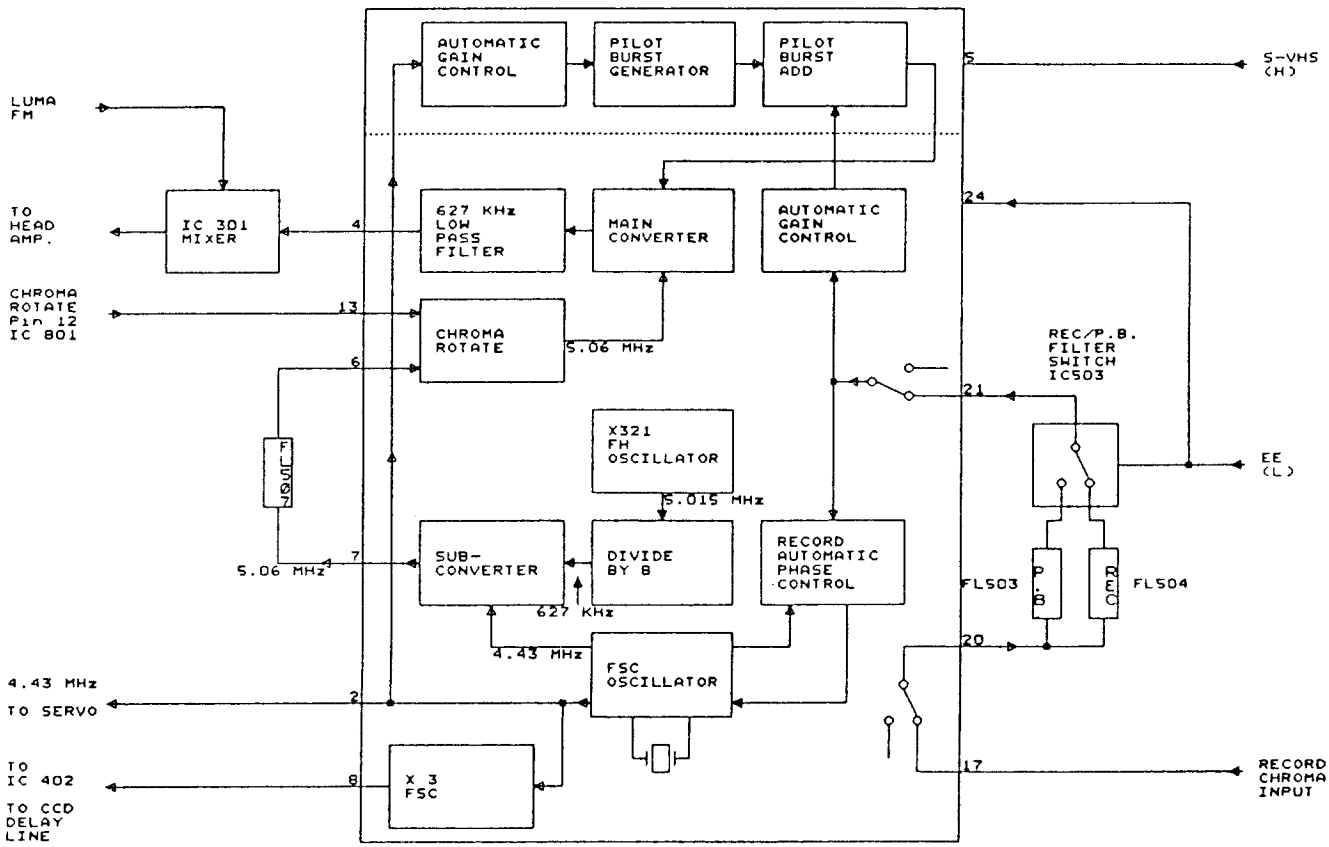
## S-V.H.S. CHROMINANCE RECORD

The chrominance signal processing, down conversion of the chrominance carrier, for S-V.H.S. is almost the same as it is for V.H.S. The main difference lies in the addition of a pilot burst to the chrominance record signal. Carrier frequency conversion and addition of the pilot burst is carried out by IC 504. This is a hybrid IC constructed of two single ICs mounted upon a small PCB.
A block diagram of its function is shown below.



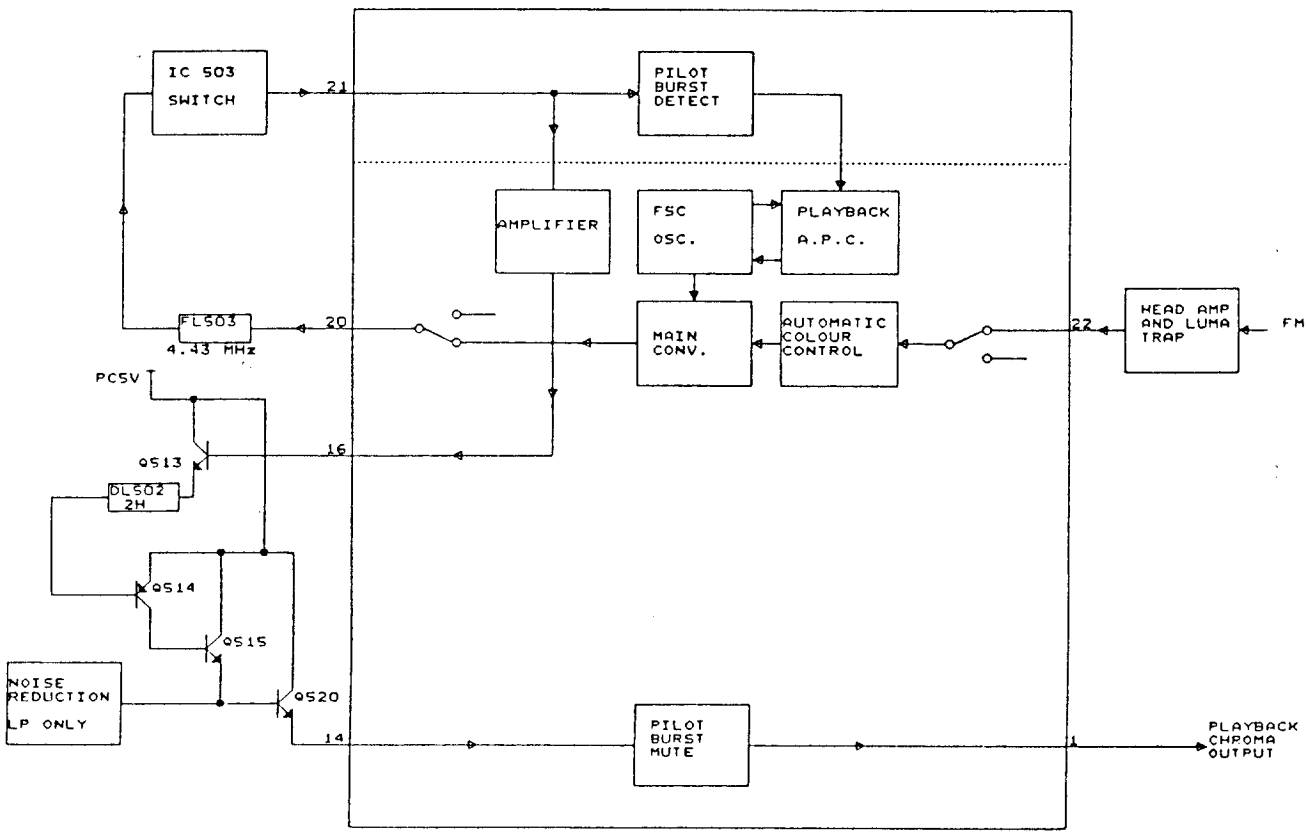

During record the off air burst signal is used as the reference signal to lock the locally generated 5.06MHz oscillator used for carrier conversion. The pilot burst is added during record and is used as the reference signal during playback before being erased.

## IC 504 CHROMINANCE PROCESSER



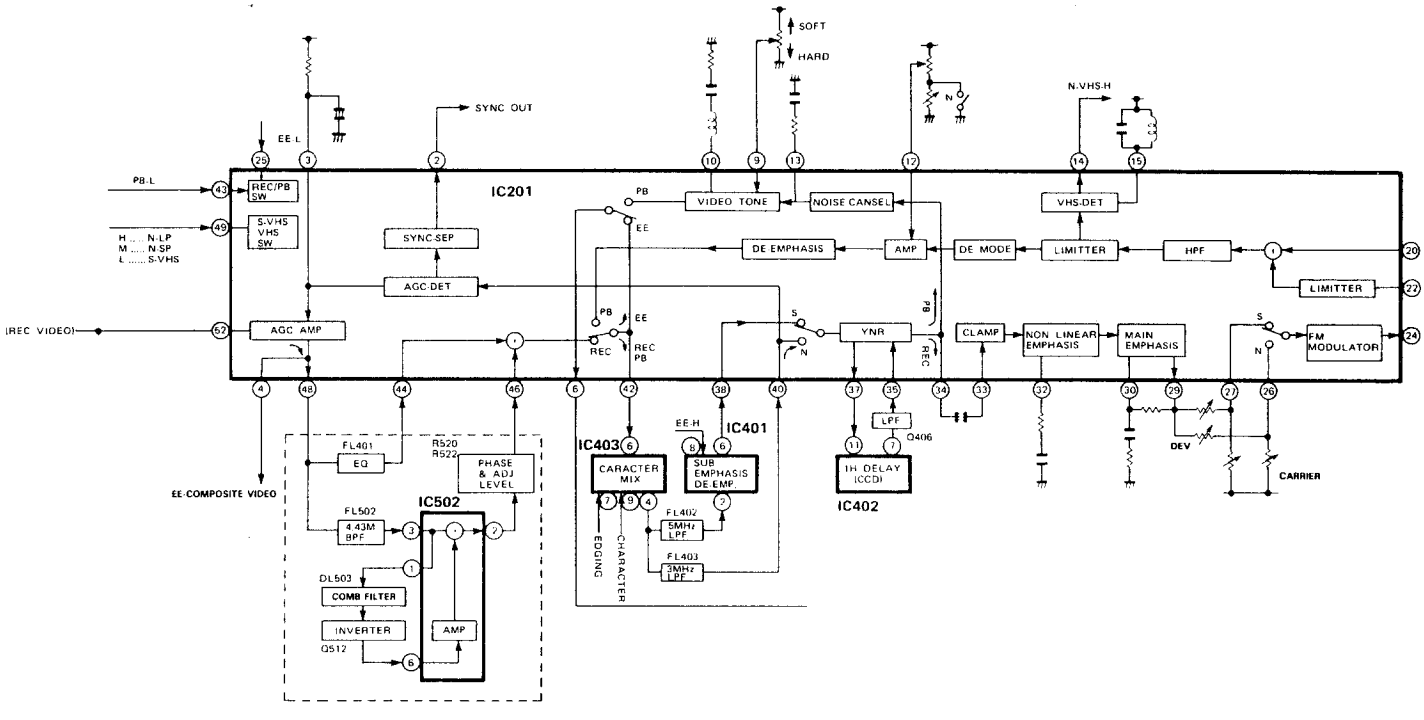
## PLAYBACK CHROMINANCE

The playback chrominance signal is passed through a LPF to remove the luminance signal content and is then inputted to the chrominance processing chip, IC 504 pin 22. After passing through the frequency conversion stage the pilot burst is detected and passed to the playback APC loop to maintain the accuracy of the F.S.C. oscillator. The playback chrominance signal is passed through a chrominance cross talk cancellation circuit formed by DL 502 and when the VCR is operated in LP mode through a further noise reduction circuit formed by DL 501. The final process is to remove the pilot burst before the chrominance signal is outputted at pin 1.



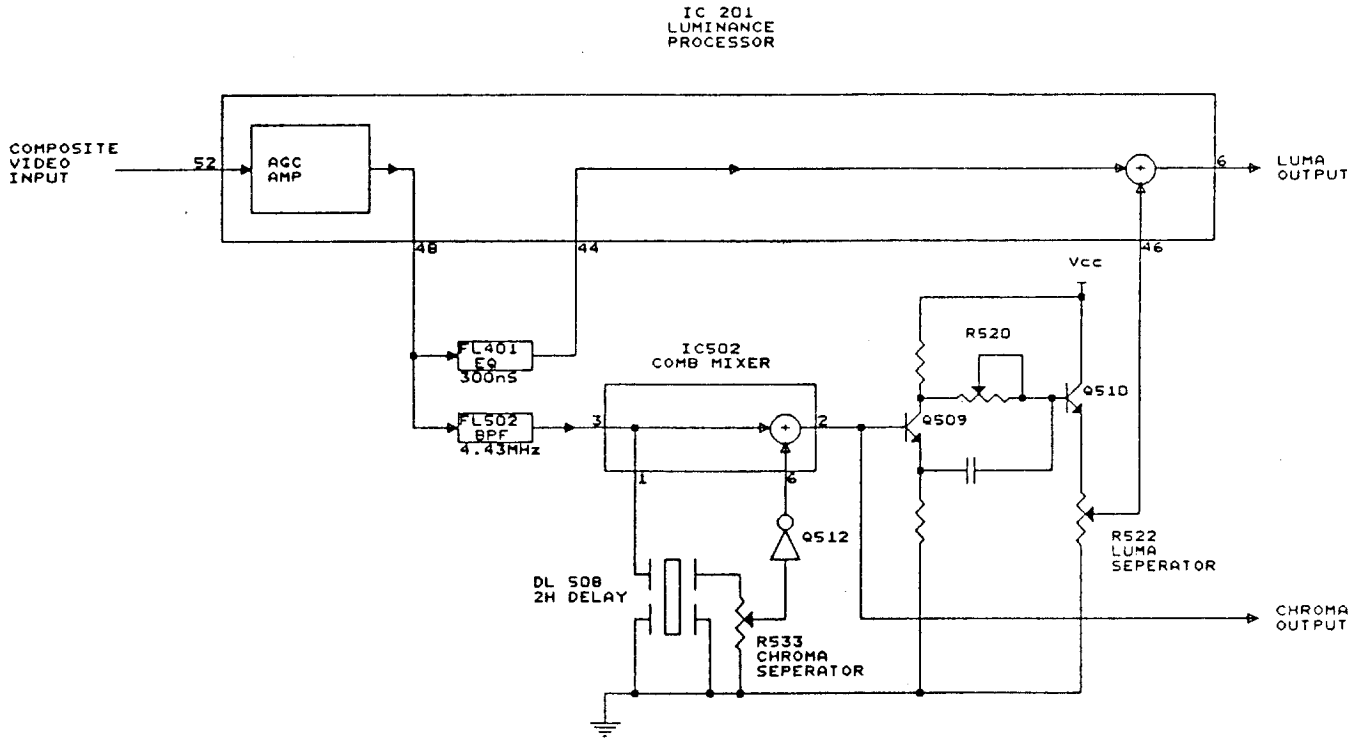
## RECORD LUMINANCE SIGNAL

When a V.H.S. recording is to be made the composite video signal is passed through a 3MHz BPF, thus removing the chrominance signal but also limiting the luminance signal bandwidth. For S- V.H.S. recordings to be made, with a luminance signal bandwidth of 5MHz, the composite video signal is passed through a more complex Y/C separation and noise cancellation circuit the output of which is a pure Y signal. Below is shown a block diagram of IC 201, the luminance processor. The signal is input at pin 52, AGC detected and outputted to the Y/C separation circuit connected to pin 48.



## Y/C SEPARATION

This circuit is formed mainly by IC 201, IC 502 and DL 508. The signal leaving IC 201 at pin 48 takes two paths. One path is through a 300 nSec equalising delay line, FL 401, and then back on pin 44 of IC 201 to a mixing circuit. The second path is to IC 502 and a 2H delay line, FL 508. The luminance content of the composite video signal is cancelled by a process of, delay and inversion leaving only the chrominance signal. The signal is then outputted to a Non Correlation Detection circuit and also, after inversion, is passed back to IC 201 pin 44. Within IC 201 the chrominance signal is mixed with the 300 nSec delayed composite video signal and the chrominance content is cancelled, leaving a pure Y signal to be recorded.



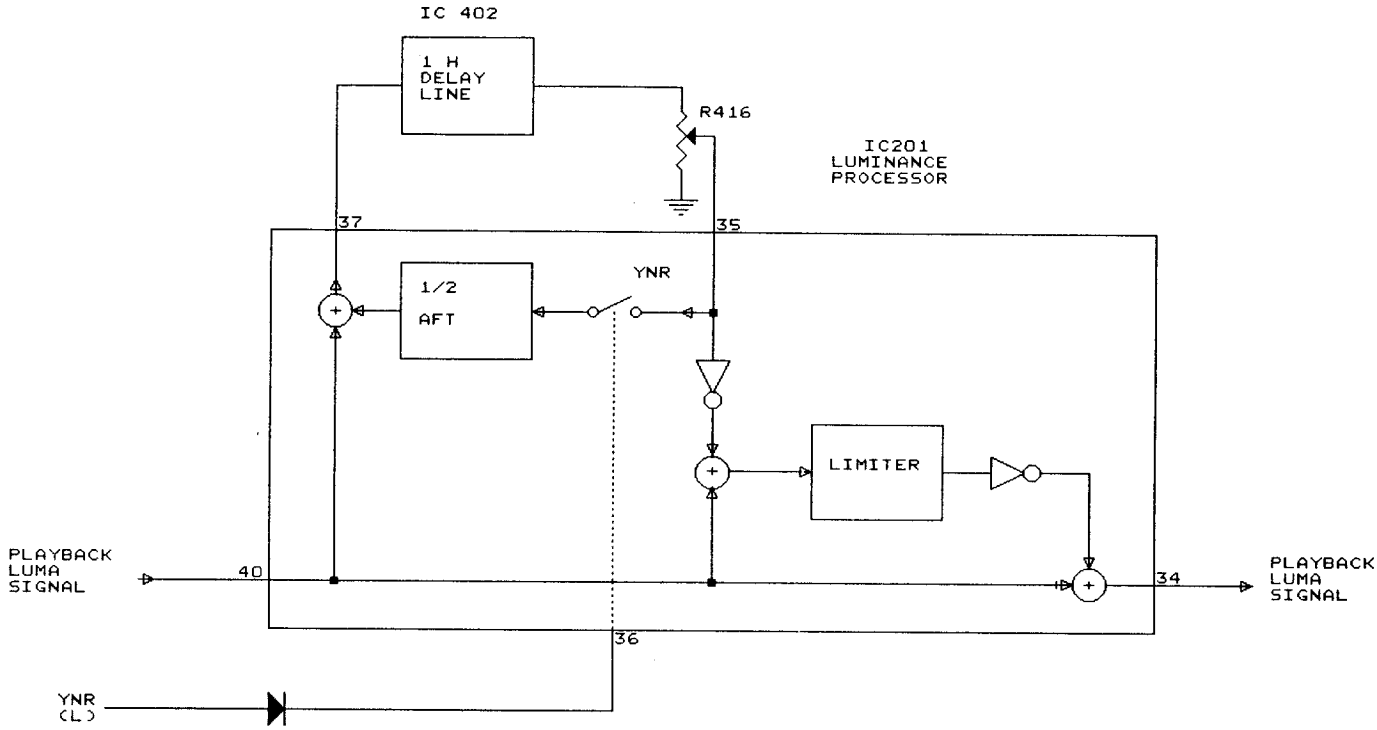

FL 401 is the 300nSec delay which matches the delay caused by the 2 H delay circuit. FL 502 limits the Y/C separation bandwidth. R533 is used to adjust the signal mixing ratio for minimum luminance signal content. R520 and R522 are used for phase and level adjustment.

From the mixing circuit the record luminance signal exits IC 201 at pin 42 and connects to the character mixing IC, IC 403. From IC 403, pin 4, the Y signal takes one of two paths depending upon the mode of operation, V.H.S. or S-V.H.S.

The V.H.S. path is FL403 , a 3MHz LPF, and back into IC 201 at pin 40. The S-V.H.S. path is through FL402, a 5MHz LPF, and connects to IC 401, a S- V.H.S. sub-emphasis chip. Additional emphasis is required for S- V.H.S. because of the higher luminance signal frequency, thus giving the higher S-V.H.S. resolution. The Y signal is then passed back to IC 201, pin 38, through a V.H.S. / S-V.H.S. switch and into a Y noise reduction circuit, YNR.

## YNR CIRCUIT OPERATION

The YNR circuit is only used during playback of V.H.S. or S-V.H.S. longplay recordings. The circuit compares line by line the playback signal and detects any noise content. The signal is subjected to a 1 H delay, IC 402, before being inverted and mixed with a none delayed signal. Any similarity between the signals is cancelled and the remaining signal is regarded as being noise. This noise signal is inverted and mixed with the wanted luminance playback signal where the noise content is cancelled.




## WHITE / DARK CLIP

From the YNR circuit the Y signal enters a non linear emphasis circuit. The amount of overshoot applied by the non linear circuit is limited by the white / dark clipping controls. The V.H.S. dark clip is fixed within IC 201, the S-V.H.S. dark clip control, R226 , is connected to pin45. V.H.S. white clip is controlled by R219 and is activated by Q204. S-V.H.S. white clip is controlled by R222 and is activated by Q203. Both white clip controls are connected to pin 43 of IC 201. The settings of the clipping levels differs for V.H.S. and S-V.H.S. so therefore require separate setting up procedures.

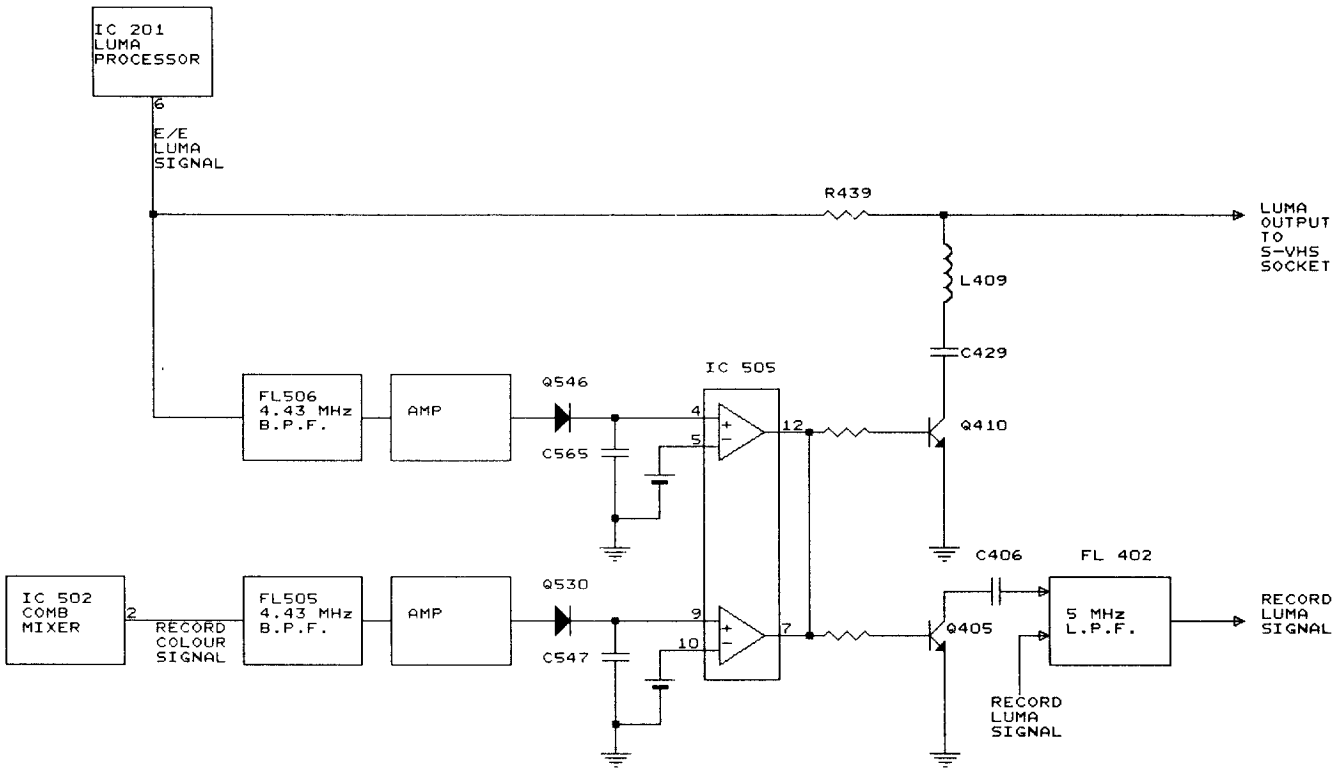
The signal now exits IC 201 at pin 29 and takes two paths to the F M modulator. The V.H.S. path is through R202, V.H.S. deviation adjust and the F M carrier frequency is fixed by R206. S-V.H.S. path is through R211, S-V.H.S. deviation adjust with the S-V.H.S. carrier frequency being fixed by R209. From the F M modulator the signal exits IC 201 at pin 24 and connects to IC 301, pin 1.

IC 301 is a record / playback equalizing amplifier. The record signal amplifiers are selected for either V.H.S. or S-V.H.S. by a control line connected to pin 6. The record chrominance signal is also mixed with the luminance signal within IC 301, and is then outputted on pin 3 to go to the video head amplifier panel.

| CLIPPING LEVEL | VHS | S-VHS |
|---|---|---|
| WHITE | 80% | 110% |
| DARK | 40% | 70% |

## NON CORRELATION DETECTION CIRCUIT

It is a requirment for the 2 H delay Y/C separation circuit to work for maximum effect that there should be no difference in the delayed and non delayed composite video signal, any differences should only be noise. In practice there are differences in chrominance signal content causing leakage of stray chrominance signal into the Y signal. The non correlation detection circuit is used to detect this stray chrominance signal and switch in additional chrominance filters.




The separated chrominance signal from the 2 H delay Y/C separation circuit is detected and used to hold IC 505 pin 7 low, keeping Q410 and Q405 off. The E/E Y and Playback Y are outputted at pin 6 of IC 201. This is applied to a 4.43MHz BPF, FL 506, any chrominance content is detected and amplified. Q546 and C565 form a peak hold circuit. If any stray chrominance signal is detected then pin 12 of IC 505 goes high turning on Q410 and Q405 Additional chrominance filters formed by L409, C429 and C406 are now switched into circuit thus removing the stray chrominance signal from the Y signal being outputted.

# Y/C BLOCK DIAGRAM